EPSON

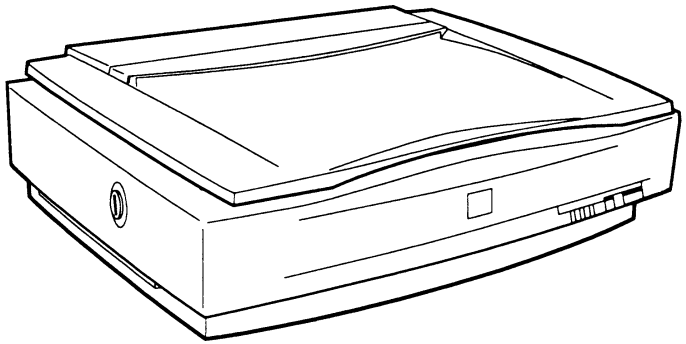
EPSON France S.A.

GT-1200

PRODUIT

SERVICE MANUAL

SERVICE MANUAL



Color Image Scanner

EPSON GT-12000

COLOR IMAGING EPSON

EPSON®

4008511

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PRECAUTIONS

Precautionary notations throughout the text are categorized relative to 1)Personal injury and 2) damage to equipment.

DANGER Signals a precaution which, if ignored, could result in serious or fatal personal injury. Great caution should be exercised in performing procedures preceded by DANGER Headings.

WARNING Signals a precaution which, if ignored, could result in damage to equipment.

The precautionary measures itemized below should always be observed when performing repair/maintenance procedures.

DANGER

1. ALWAYS DISCONNECT THE PRODUCT FROM THE POWER SOURCE AND PERIPHERAL DEVICES PERFORMING ANY MAINTENANCE OR REPAIR PROCEDURES.
2. NOWORK SHOULD BE PERFORMED ON THE UNIT BY PERSONS UNFAMILIER WITH BASIC SAFETY MEASURES AS DICTATED FOR ALL ELECTRONICS TECHNICIANS IN THEIR LINE OF WORK.
3. WHEN PERFORMING TESTING AS DICTATED WITHIN THIS MANUAL, DO NOT CONNECT THE UNIT TO A POWER SOURCE UNTIL INSTRUCTED TO DO SO. WHEN THE POWER SUPPLY CABLE MUST BE CONNECTED, USE EXTREME CAUTION IN WORKING ON POWER SUPPLY AND OTHER ELECTRONIC COMPONENTS.

WARNING

1. REPAIRS ON EPSON PRODUCT SHOULD BE PERFORMED ONLY BY AN EPSON CERTIFIED REPAIR TECHNICIAN.
2. MAKE CERTAIN THAT THE SOURCE VOLTAGES IS THE SAME AS THE RATED VOLTAGE, LISTED ON THE SERIAL NUMBER/RATING PLATE. IF THE EPSON PRODUCT HAS A PRIMARY AC RATING DIFFERENT FROM AVAILABLE POWER SOURCE, DO NOT CONNECT IT TO THE POWER SOURCE.
3. ALWAYS VERIFY THAT THE EPSON PRODUCT HAS BEEN DISCONNECTED FROM THE POWER SOURCE BEFORE REMOVING OR REPLACING PRINTED CIRCUIT BOARDS AND/OR INDIVIDUAL CHIPS.
4. IN ORDER TO PROTECT SENSITIVE MICROPROCESSORS AND CIRCUITRY, USE STATIC DISCHARGE EQUIPMENT, SUCH AS ANTI-STATIC WRIST STRAPS, WHEN ACCESSING INTERNAL COMPONENTS.
5. REPLACE MALFUNCTIONING COMPONENTS ONLY WITH THOSE COMPONENTS BY THE MANUFACTURE; INTRODUCTION OF SECOND-SOURCE ICs OR OTHER NONAPPROVED COMPONENTS MAY DAMAGE THE PRODUCT AND VOID ANY APPLICABLE EPSON WARRANTY.

PREFACE

This manual describes basic functions, theory of electrical and mechanical operations, maintenance and repair procedures of GT-12000. The instructions and procedures included herein are intended for the experienced repair technicians, and attention should be given to the precautions on the preceding page. The chapters are organized as follows:

CHAPTER 1. PRODUCT DESCRIPTIONS

Provides a general overview and specifications of the product.

CHAPTER 2. OPERATING PRINCIPLES

Describes the theory of electrical and mechanical operations of the product.

CHAPTER 3. TROUBLESHOOTING

Provides the step-by-step procedures for troubleshooting.

CHAPTER 4. DISASSEMBLY AND ASSEMBLY

Describes the step-by-step procedures for disassembling and assembling the product.

CHAPTER 5. ADJUSTMENTS

Provides Epson-approved methods for adjustment.

CHAPTER 6. MAINTENANCE

Provides preventive maintenance procedures and the lists of Epson-approved lubricants and adhesives required for servicing the product.

APPENDIX

Provides the following additional information for reference:

- *Connector pin assignments*
- *Electric circuit boards components layout*
- *Exploded diagram*
- *Electrical circuit boards schematics*

REVISION STATUS

Rev.	Date	Page(s)	Contents
A	1997/10/20	All	First release

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CHAPTER

1

PRODUCT DESCRIPTIONS

1.1 OVERVIEW

The GT-12000 is an A3 size flat-bed type color image scanner. The main features of the scanner are:

- ❑ High resolution
  Optical resolution is 800 dpi.

- ❑ Wide readable area
  Accommodates up to A3 size.

- ❑ High-quality image
  12bit A/D input/output (optical density is 3.0.)

- ❑ High-speed scanning
  Scanning A3/Portrate At 800dpi / Draft-mode;
  Full-color = Approx. 15mS/line
  256 Gray = Approx. 10.8mS/line
  Line art = Approx. 10.8mS/line

- ❑ Adjustable Focusing function
  Adjustable up to 5mm above the surface of document table.

- ❑ Quick operation
  Xe-Gas Cold Cathode Fluorescent Lamp allows no initial light-up for immediate scanning.

- ❑ New command level: ESC/I-B8 (B6 level with Focus control)

- ❑ Optional unit enhancing the function of the unit
  - ■ Transparency Unit
  - ■ Duplex scanning ADF (Automatic Document Feeder)

1.2 SPECIFICATION

GENERAL

Type:	Flat-bed color image scanner
Scanning Method:	Sub-Scanning mirror movement system
Photoelectric Device:	Color CCD Line sensor
Color Separation:	Color filter separation
Light Source:	Xe-Gas Cold Cathode Fluorescent Lamp
Scanning Resolution:	800 (Main) by 800 (Sub) dpi
Output Resolution:	50 to 3200dpi (1dpi increment)
Effective Picture Element:	9760 by 13760 pixel (Max.)
Maximum Readable Area:	12.2 by 17.2 inch (310 by 437mm)
Scanning Speed:	At 800 dpi / Draft mode;

Table 1-1. Scanning Speed

Original	A4/Portrait	A4/Portrait - A3/Portrait
Reading Area	Less than 210mm	210 to 310mm
Line Art	Approx. 7.5mS/line	Approx. 10.8mS/line
256 Gray-scale	Approx. 7.5mS/line	Approx. 10.8mS/line
Full Color	Approx. 10.0mS/line	Approx. 15.0mS/line

IMAGING FUNCTIONS

Gradation:	Input/internal process =	12bit/pixel
	Output =	8 or 12bit/pixel
Zoom:	50 to 200% (1% increment)	
Gamma Correction:	CRT (A/B)	
	PRINTER (A/B/C)	
	User definable (1 level)	
Color Correction:	Impact-Dot Printer	
	Thermal Printer	
	Ink jet Printer	
	CRT Display	
	User definable (1 level)	
Brightness Control:	7 levels	
Image Processing:	Bi-level=	Fixed threshold
		TET
	Half-toning=	Error diffusion (A/B/C)
		Dither (Resident) (A/B/C/D)
		Dither (user definable) (A/B)
Focusing:	One-piece CCD/Lens movement system	

INTERFACE

Standard Interface:	Bi-Directional Parallel
	SCSI (50/50 pin connectors)

SOFTWARE

Commend Level:	ESC/I-B8 (B6 level with Focus control)

ELECTRICAL SPECIFICATION

Power supply voltage:	[120 V version]
	Rated voltage = AC100 - 120 V (± 10%)
	[220-240 V version]
	Rated voltage = AC220 - 240 V (± 10%)
Rated frequency range:	50 / 60 Hz (49.5 - 60.5 Hz)
Power consumption:	Approximately 60 W (without an optional unit)
	Maximum 75 W (with an optional unit)
Insulation resistance:	10 M Ω at 500 VDC
	(between AC line and chassis)
Dielectric strength:	AC 1.5 KV / minute
	(between AC line and chassis)
Static electricity:	Panel = 10 KV
	Metal = 7 KV / 150 pF, 150 Ω

SAFETY, EMC

Safety regulation:	UL1950 with D3
	CSA C22.2 NO. 950 with D3
Low voltage directive 73/23/EEC:	EN60950 (TUV)
	EN60950 Nordic Deviation (NEMKO)
EMC:	FCC Part15 Subpart B Class B (USA)
	CSA C108.8 Class B (Canada)
	AS/NZS3548 Class B
Directive 89/336/EEC:	EN55022 Class B
	EN61000-3-2
	EN61000-3-3
	EN50082-1
	IEC 801-2
	IEC 801-3
	IEC 801-4

ENVIRONMENTAL CONDITIONS

Temperature:	Operating =	5 to 35°C
	Storage =	-25 to 60°C
Humidity:	Operating =	10 to 80% (no condensation)
	Storage =	10 to 85% (no condensation)

RELIABILITY

Main unit:	MCBF 100,000 cycle

OPERATING CONDITIONS

Dust:	Ordinary office or home conditions. (Should be kept away from extreme dust.)
Illumination:	Operation under direct sunlight or near strong light source should be avoided.

DOCUMENT

Reflective type:	Smooth surface such as a printing and photograph.
Transparency type:	Reversal film, Negative film

Note: *The optional transparency unit must be used.*

PHYSICAL DIMENSIONS AND WEIGHT

Dimensions:	656 (W) x 458 (D) x 170 mm (H) (See Figure 1-1.)
Weight:	Approximately 20 Kg

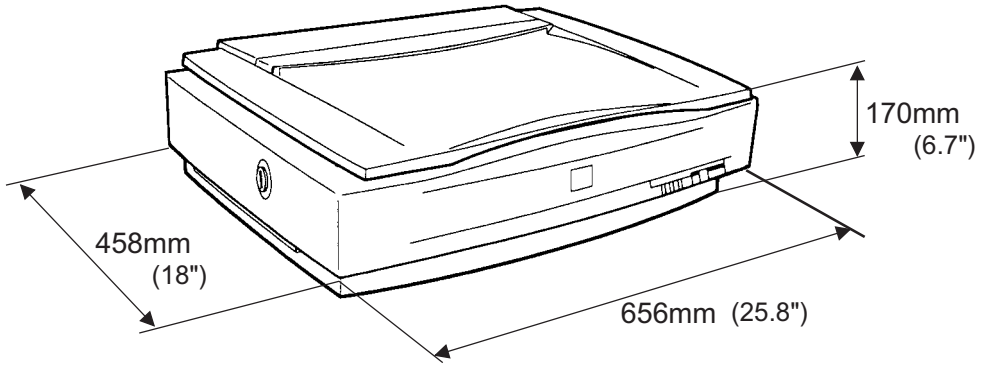


Figure 1-1. External Dimension of the GT-12000

1.3 INTERFACE SPECIFICATION

This scanner is equipped with the following interfaces:

- Bi-directional Parallel Interface
  - Data: 8 bit parallel
  - Handshake: BUSY, /ACK handshaking
  - Signal: TTL level
  - Connector: 36 pins (Amphenol)

- SCSI interface
  - Function: Conforms to ANSI Standard X3.131-1986.
  - Electrical specification: Conforms to ANSI Standard X3.131-1986. (TTL compatible level)
  - Connector: 50 / 50 pin (Amphenol)
  - Terminator: Internal terminator Switches between “active” and “ inactive”
  - SCSI ID Set with an internal rotary switch (Range: 0 - 7)

1.4 CONTROL CODE

The command level for this scanner is ESC/I-B8. The commands supported are shown in the table below.

Table 1-2. Control Code Summary

Category	Command Name	Code
Execute Command	Identity Request	ESC I
	Status Flag Request	ESC F
	Extended Status Flag Request	ESC f
	Parameter Request	ESC S
	Scanning Start	ESC G
Data Format Setting	Set Data Format	ESC Di
	Set Resolution	ESC R n1 n2
	Set Zooming	ESC H i1 i2
	Set Read Area	ESC A n1 n2 n3 n4
	Set Color	ESC Ci
	Mirroring	ESC Ki
Image Setting	Set Brightness	ESC Li
	Set Gamma Correction	ESC Zi
	Download Gamma Table	ESC zi d0 d1 - d255
	Set Sharpness	ESC Qi
Image Processing	Set Digital Halftoning	ESC Bi
	Set Auto Area Segmentation	ESC si
	Download Dither Pattern	ESC b l l j d (j2)
	Set Color Correction	ESC Mi
	Download Color Correction	ESC m d1 d2 - d9
	Set Threshold	ESC t

Table 1-3. Control Code Summary (continued)

Category	Command Name	Code
Auxiliary	Set Scanning Mode	ESC gi
	Initnialize	ESC @
	Set Line Counter	ESC di
	Control Option	ESC ei
	Set Focus	ESC pi
	Focus Position Request	ESC q
	Set Ratio Correction for Main and Sub Scan	ESC Wi
	Set the Film type	ESC Ni
	Eject Paper	ESC FF
	Feed Paper	ESC PF
Control	Normal Response	ACK
	Abnormal Response	NACK
	Abort Scanning	CAN
	Header	STX

1.5 OPERATION SPECIFICATIONS

1.5.1 Switch Specification

This scanner is equipped with 4 switches. Their functions are described below:

- "**OPERATE** "
  - Turns on and off the scanner.
  - Pressing this switch for power-on initializes the scanner.
- "**RESET**"
  Initializes the scanner.
- **SCSI ID rotary switch** (located at the back of the scanner)
  Sets the SCSI device ID for this scanner when the SCSI interface is used to connect the scanner with the host computer.
  Note: *The factory default value for this scanner is "2".*
- **SCSI terminator setting switch** (located at the back of the scanner)
  Alternates the internal terminator setting between "Connected" and "Disconnected" when the SCSI interface is in use.
  Note: *The factory default setting for this switch is "On" (Connected).*

1.5.2 LED Specification

This scanner has the following 3 LED indicators:

- **OPERATE** ■
  Indicates the scanner's power On/Off status. It is on when the scanner power is on.
- **READY** ■
  - Comes on when the scanner is ready to receive commands. It flickers during scanning due to data transmission between the host computer and the scanner.
  - Indicates an error type in combination with the ERROR LED indicator when an error has occurred.
- **ERROR** ■
  Comes On when an error has occurred.

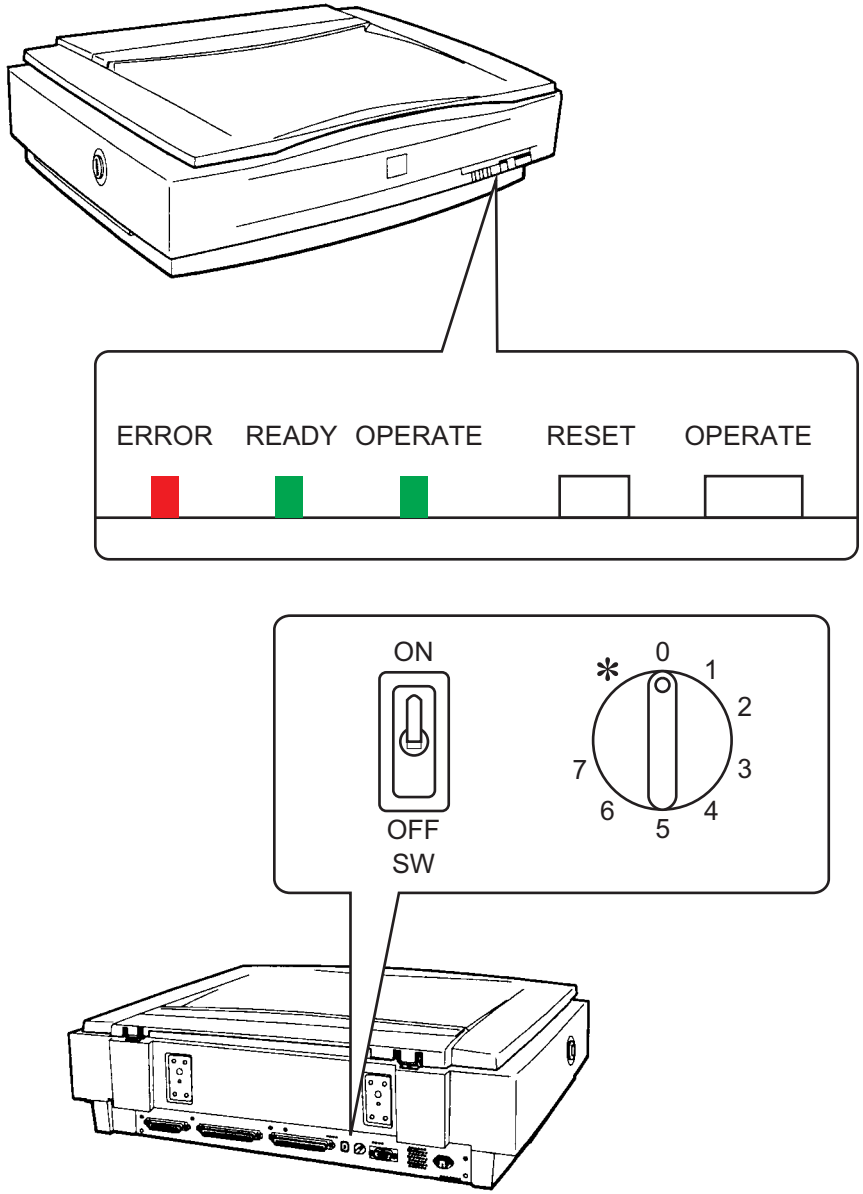


Figure 1-2. Buttons, Switches and LED Indicators

1.5.3 Switch Setting

Among the switches equipped with this scanner, SCSI switch and the terminator switch, which are used for SCSI interface, have the following settings:

❑ SCSI-ID setting switch

ID No.	Availability	Note
0	Available	Normally assigned to other SCSI device such as a hard disc.
1	Available	Normally assigned to other SCSI device such as a hard disc.
2	Available	Set at the factory to the scanner.
3	Available	
4	Available	
5	Available	
6	Available	
7	Available	Normally assigned to the SCSI host adopter.
(Blank)	Not Available	Not effective / Not used
*	Not Available	Not effective / Not used

✓CHECK POINT

Do not set the ID number that is already assigned to other SCSI device.

❑ Terminator switch

Setting	Note
ON	Connects to the terminal resistor. /Factory default setting
OFF	Disconnects from the terminal resistor.

✓CHECK POINT

Be aware that the terminator switch must be set according to the scanner location on the "daisy-chain".

1.5.4 Error Indication

When an error has occurred, the error type is indicated by the corresponding combination of the "READY" and "ERROR" LED indicators.

Table 1-4. Error Types and Corresponding Indications

READY ■	ERROR ■	Error Type
ON	ON	Command error
OFF	Blinks	Communication error
Blinks	Blinks	Fatal error
OFF	OFF	Option error

Note: *The remedies for these errors are provided in Chapter 3 "Troubleshooting".*

1.5.5 Readable Area

The origin point for this scanner is marked at the rear left corner of the document table viewed from the front. See Figure 1-3 for the maximum readable area of the scanner.

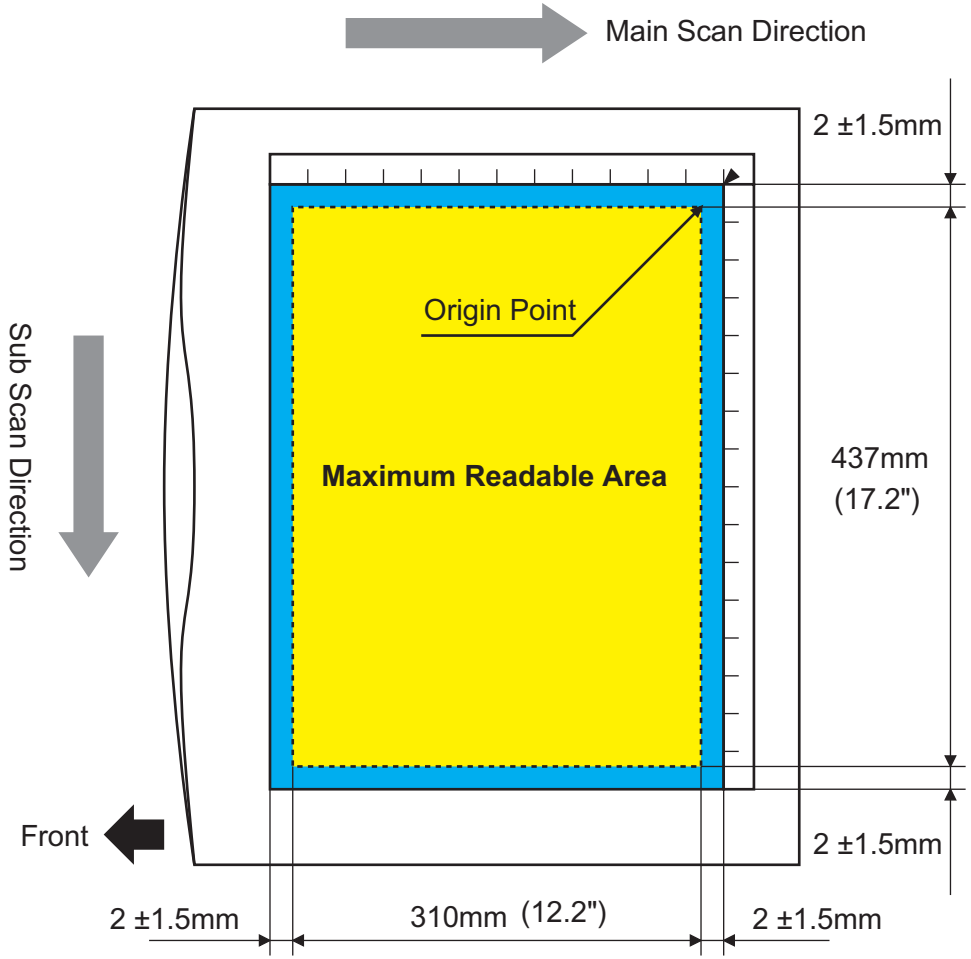


Figure 1-3. Maximum Readable Area

1.5.6 Transportation Screw

A transportation screw is attached to the left side of the scanner viewed from the front. Fastening the screw fixes the CR to protect the scanner from the shock while the scanner is transported or moved. Be sure to turn the screw to the unlocking position (Described in the figure below.) before turning the scanner power on.

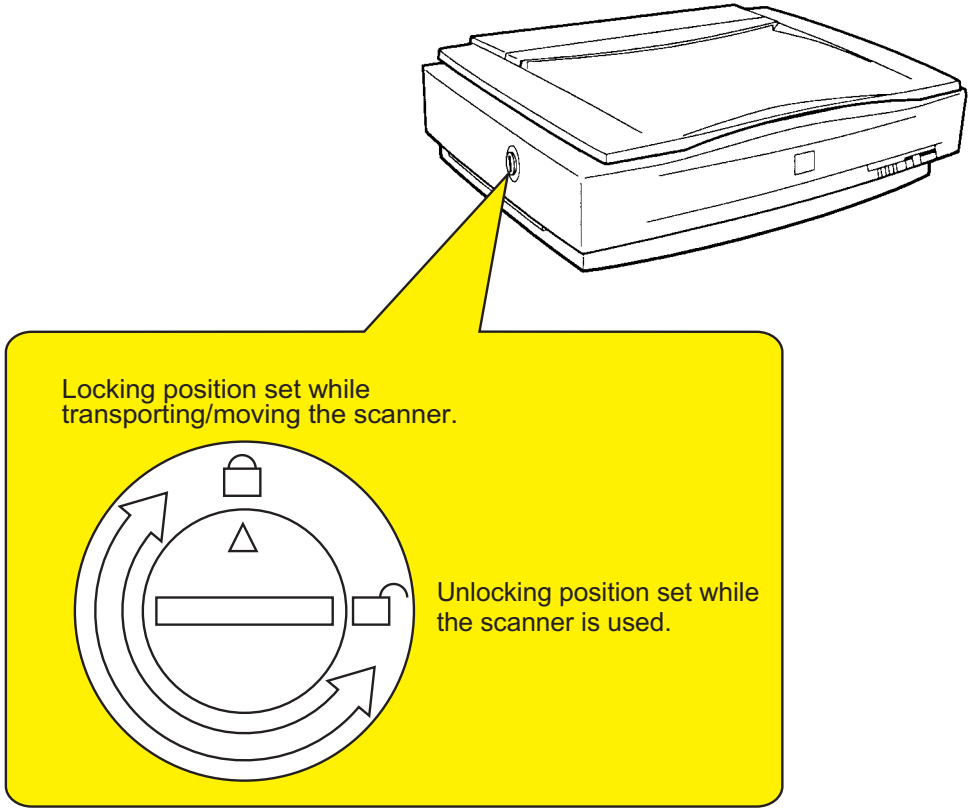


Figure 1-4. Transportation Screw

CHAPTER

2

OPERATING PRINCIPLES

2.1 GENERAL DESCRIPTION

The EPSON GT-12000 is mainly composed of the following units:

- ❑ Scanner mechanism
  (Lamp/Mirror units, CR drive mechanism, integral lens/CCD sensor unit drive mechanism)
- ❑ Control Circuit
- ❑ Power supply circuit

The EPSON flat-bed type scanners usually read images by moving the integral CR unit which consists of the lamp, mirror, lens/CCD sensor. This scanner, however, characteristically has the CCD sensor and the lens in the whole unit attached onto the mechanism as an independent unit. This scanner is also equipped with the newly designed focusing function which enables the scanner to focus by adjusting the distance between the lens and the CCD sensor. Therefore, the lens unit is set movable and driven by the specified motor. Since the separate units in the mechanism such as the lamp (light source) and the mirrors move at their own speed for reading, the incident distance of the reflected light from the document to the CCD sensor is kept constant.
The control circuit board and the power supply circuit board are stored in the separate shield compartment. Since it is only connected to the connector board in the scanner mechanism, it is removed and maintained with ease.

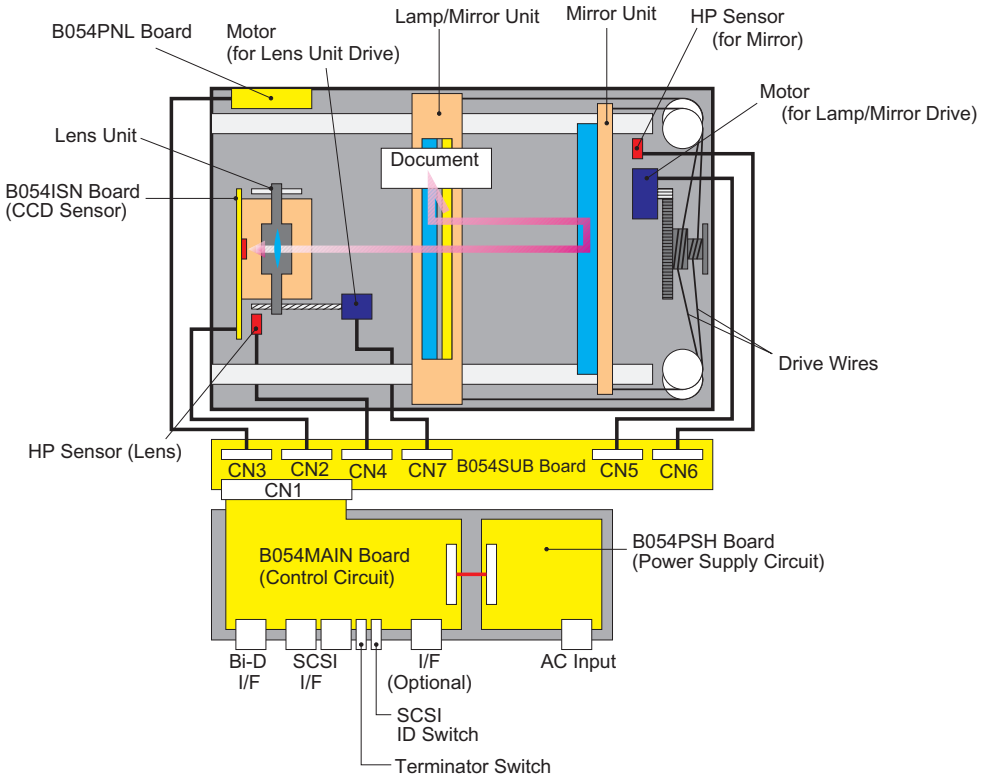


Figure 2-1. Main mechanism Structure of the GT-12000

2.2 MECHANISM OPERATING PRINCIPLES

Compared with other EPSON scanners, the main feature of this scanner lies in its new optical mechanism used for reading images. Instead of the united lamp & CCD movement system used for other scanners, this scanner scans with the fixed CCD sensor and separate lamp and the mirror units. Since the color CCD line sensor is used for the reading device, only one light source is equipped and light is separated through the RGB color filter.

As shown in Figure 2-2, the light source (high luminance cold cathode xenon lamp), the first reflection mirror unit and the second reflection mirror unit move independently at their own speed. Therefore the length of the incident light reflected from the document to the CCD sensor is kept constant. (Otherwise, excluding the fixed L1 and L2, LV1 and LV2 keep changing to make the incident light length “L” constant.) Drive from the stepping motor moves each mirror unit via the wires.

The CCD sensor and the lens are united into one unit, which is semi-fixed on the base frame. For focusing function, it moves toward the optic with the drive sent from the motor. (The focusing area with this function is from 0 to 5 mm (maximum) above from the glass surface.

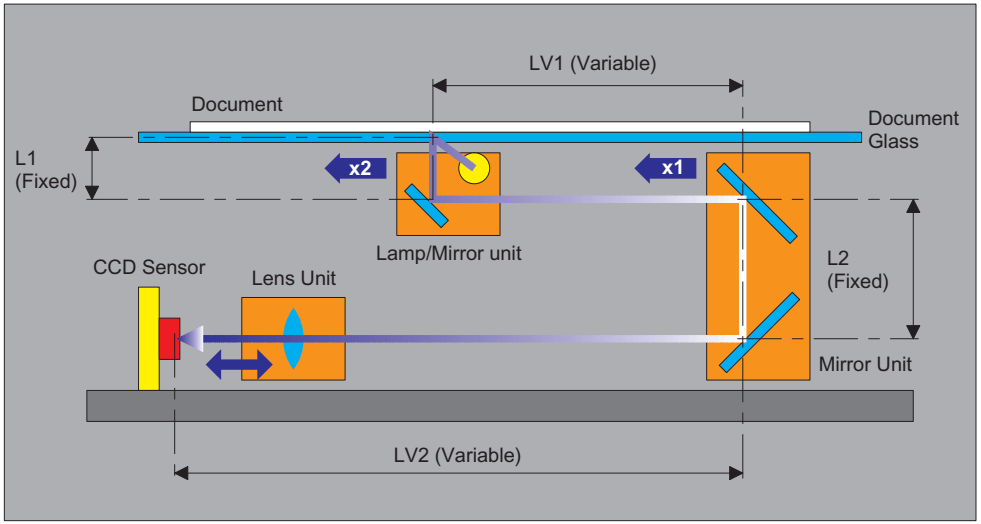


Figure 2-2. Optical Unit Structure

2.3 ELECTRICAL CIRCUIT OPERATIONS

This section describes the electrical circuit of the GT-12000.

2.3.1 Control Circuit Operation

The control circuits of this scanner are:

- ❑ B054MAIN board (Main control circuit board)
- ❑ B054SUB board (Relay board)
- ❑ B054PNL board (Control panel board)
- ❑ B054ISN board (CCD sensor board located on the CR)

Among various functions controlled by B054MAIN board, the core control circuit of the scanner, and B054ISN, process from reading image with the CCD sensor to processing image signals is described below:

- ❑ B054ISN Board (CCD image sensor)
  - ■ Photoelectric conversion:
    Converts light reflected from the document (light energy) into electrical energy (electrical charge).
  - ■ Amplification
  - ■ A/D conversion:
    Converts the image data produced in the form of analog electrical signal into 12-bit digital data.
- ❑ B054 MAIN Board (processing image data)
  ASIC (IC24) on this board manages most of the following functions:
  - ■ Shading correction:
    Performs image data correction on a black and white basis.
  - ■ Numbers of image correction such as gamma correction, color correction, halftoning correction. (They are carried out according to the settings on the host side.)

After passed these processes, image data is finally output to the host.

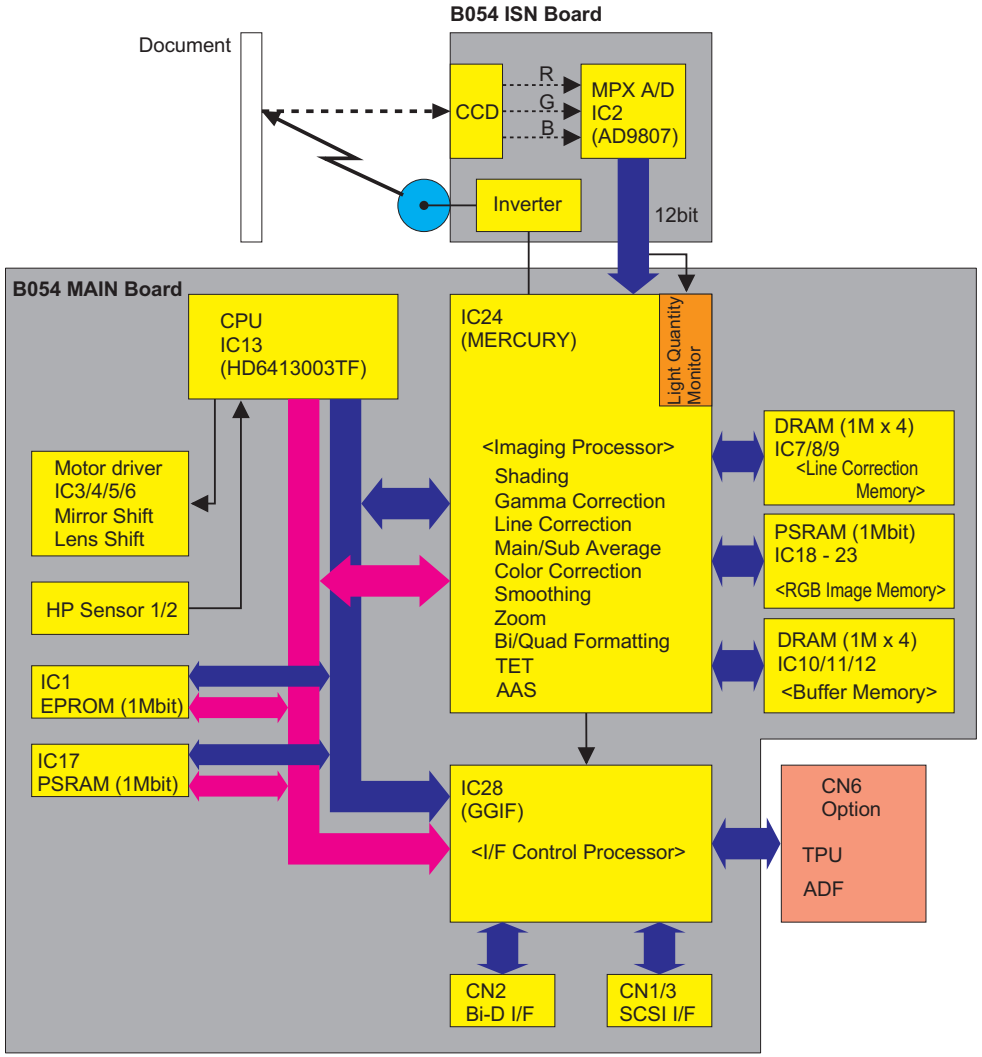


Figure 2-3. Control Circuit Block Chart

B054MAIN BOARD

Name	Location	Description
CPU HD6413003TF	IC13	The CPU, which operates at 16 MHz, controls this board.
ASIC MERCURY	IC24	an image processor which controls the followings: • CCD • Line correction memory • Buffer memory • Image processing
ASIC CGIF	IC28	This I/F control processor controls the followings: • SCSI I/F • Bi-D I/F • Address decode • PSRAM refresh • Reset control
DRAM (1MX4)	IC7-9 IC10-12	Line correction memory Buffer memory
PSRAM (1M)	IC8-23	RGB image memory
ROM (1M)	IC1	Firmware memory

B054ISN BOARD

Name	Location	Description
CCD sensor ILX734K	IC1	Color CCD line sensor • Effective pixel = 10500x3 lines • Single side reading system • Shutter function
ADC AD9807	IC2	A/D converter processing IC Minimum resolution = 12 bit

B054SUB BOARD

This is a relay board, a module is in the shield compound along with the PSB/PSE board, which connects the B054ISN in the mechanism with the B054PNL board.

B054PNL BOARD

This board has a power switch (push-lock), RESET switch and LED indicators (OPERATE, READY, ERROR).

2.3.2 Power Supply Circuit Operation

Since the power supply circuit board B054PSH for this scanner meets the universal specification, it can use the rated voltage in the range from 100V to 240V.

The electrical circuit for the AC input part is designed on the basis of 200V line. In case the input voltage is 200V line level, the ordinary full wave rectifying system is used. With this system, the voltage is rectified by the diode bridge DB1 and then smoothed by the serial smoothing capacitors C11 and C32 to produce approximately 250 VDC.

On the other hand, if the input voltage is 100V line level, the doubled voltage rectifying system is used instead. With this system, the input AC current is separated into the following 2 flows; the positive half cycles of the current flow through the control IC (IC2) (from Pin 2 to Pin 3) via the diode bridge (DB1) and the smoothing capacitor C11, and the negative half cycles of the current, however, flow through the smoothing capacitor (C32) and DB1 via IC2 (from Pin 3 to Pin 2). Through these flows, the positive and negative AC current are separately charged in the smoothing capacitors C11 and C32, respectively, and the doubled VDC (approximately 250 VDC) equivalent to the input voltage of the 200V line is produced. At power-on, the control circuit (IC2) is activated by the full wave rectifying system. Then, if the input voltage is 100 VDC line level, the system is automatically switched to the doubled voltage rectifying system after certain period set by the circuit constant.

Except for the full wave rectifier circuit/voltage doubler rectifier circuit at the AC input part, the normal RCC (Ringing Choke Converter) regulator circuit is used for the rest part of the power supply circuit, and the different levels of VDC are distributed to corresponding mechanisms, as shown in Table 2-1:

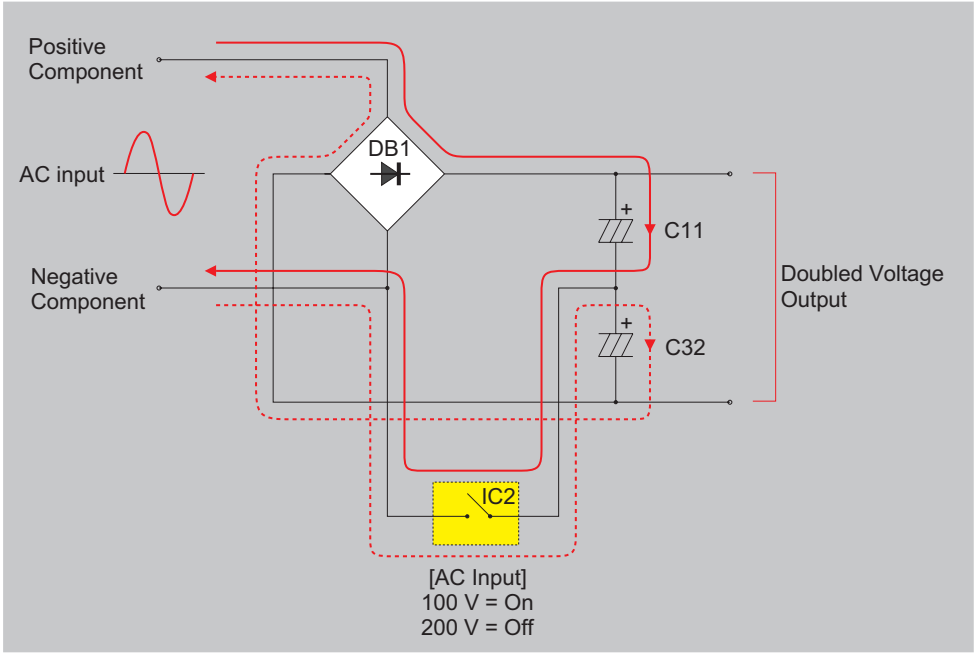


Figure 2-4. Voltage Doubler Rectifier Circuit Operation

Table 2-1. DC Output Power

Output VDC	Application
+5 V	Logic power lines
+24 V	❑ Motor drive power source ❑ Power source for the lamp (inverter)
+15 V	+12 V production (Power used to drive the cooling fan for the shield compartment which stores B054 MAIN and B054PSH.)

CHAPTER

3

TROUBLESHOOTING

3.1 OVERVIEW

This chapter describes the troubleshooting which enables you to solve the problem efficiently when the scanner is operating abnormally. The remedies for the errors detected by the self-diagnostic function and the check point for each phenomenon are described in the following sections.

3.1.1 Error Detection by the Self-Diagnostic Function

The self-diagnostic function equipped with this scanner automatically detects operating status of each part. The abnormal phenomenon detected by the function and remedies are as follows:

Command Error

LED Status	Cause	Operation/Condition
READY ERROR	Undefined command is detected.	Ignores the wrong command /parameter (No change made for the current settings.), and returns NACK to wait for the next command/ parameter.
Remedy	The error is cleared by the correct command/ parameter.	

Communication Error

LED Status	Cause	Operation/ Condition
READY ERROR	• Wrong procedure/operation is detected in communication. • In case of SCSI, communication stops for over 30 seconds in any phase other than bus free phase.	The lamp goes off and the scanner stops operating.
Remedy	Turn the scanner Off and back On or press the “RESET” switch.	

Fatal Error

LED Status	Cause	Operation/Condition
READY ERROR	<Defect in the hardware> • The lamp does not light. • Scanner is turned on with the CR unlocked. • Other defects in the scanner.	• The lamp goes off and the scanner stops operating. • Sets the status bit “7”.
Remedy	Turn the scanner Off and back On or press the “RESET” switch.	

Option Error

LED Status	Cause	Operation/Condition
READY ERROR	<Defect in the options> • The scanner cover is left open. • Paper end, etc..	Sets the status bit “7”.
Remedy	Remove the cause of the error.	

✓CHECK POINT

[Option Error] is detected when the option is installed in the operative condition only.

3.1.2 Troubleshooting

This section provides test points for each major unit and check points for each abnormal phenomenon.

3.1.2.1 Test Points

Test points for the motors and sensors are shown in the tables below.

Motors

❑ Condition: Test the motor without any cables connected.

Motor	Test Point	Signal Level
Motor (for driving the mirror)	<Cable connector> Between Pin 1 and Pin3 Between Pin 2 and Pin 4	15.0 Ω
Motor (for driving the focusing mechanism)	<Cable connector> Between Pin 1 and Pin3 Between Pin 2 and Pin 4	15.5 Ω

Sensors

❑ Condition: Test with the scanner power on.

Motor	Test Point	Signal Level
HP sensor (Mirror)	<B054SUB board> CN6: Pin 1 (Signal) Pin 2 (GND)	H: In the home position L: Off the home position
HP sensor (Lens/CCD)	<B054SUB board> CN4: Pin 1 (Signal) Pin 2 (GND)	H: In the home position L: Off the home position

⚠CAUTION ***Be careful not to short-circuit the signals while checking them.***

3.1.2.2 Check Points for Abnormal Phenomenon

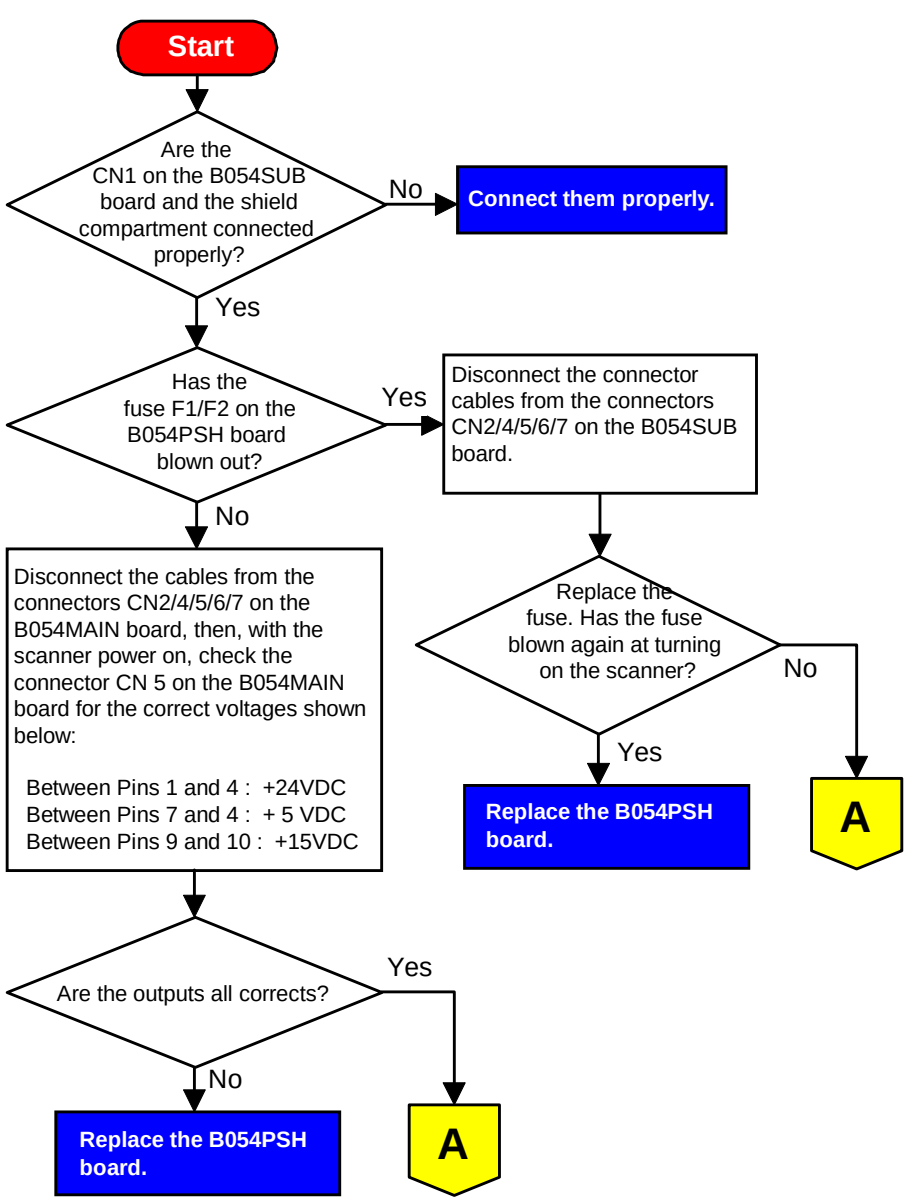
See the table below which shows the abnormal phenomenon typically occurs.

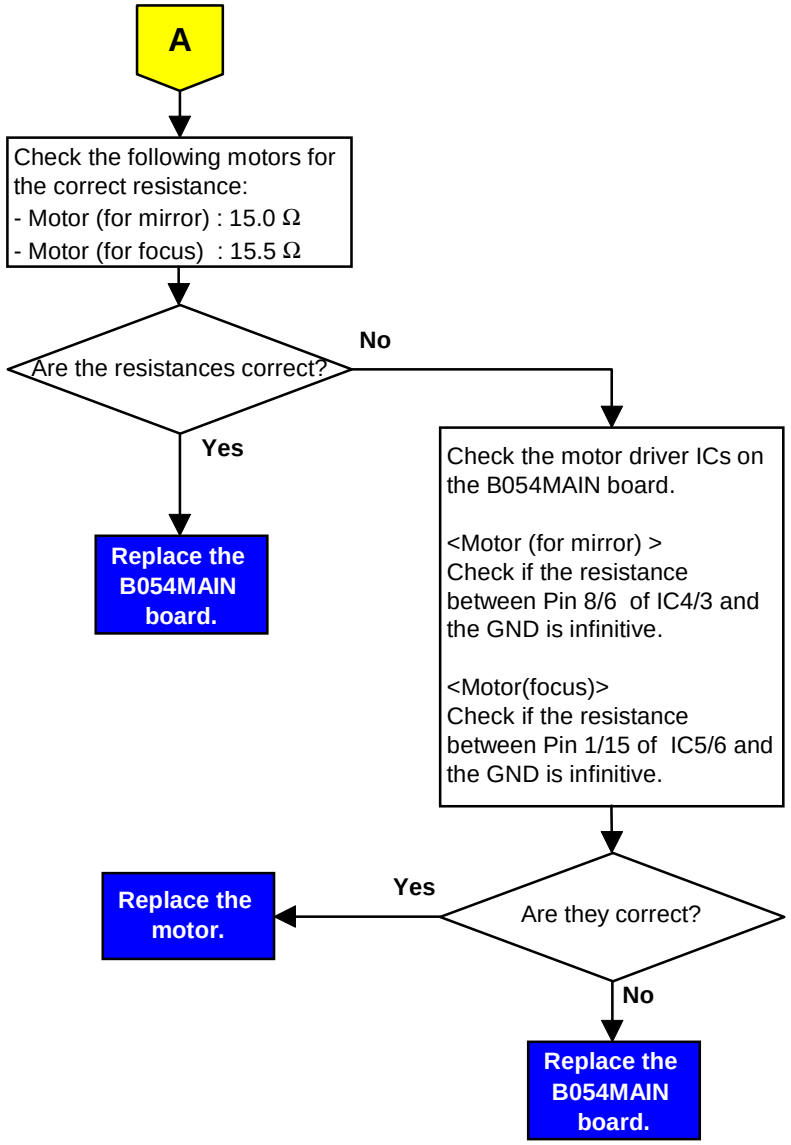
Table 3-1. Abnormal Phenomenon

Abnormal Phenomenon	Description	Flowchart to refer
The scanner doesn't operate at power on.	"OPERATE" LED does not light.	3-1
"Fatal Error" is indicated and. is not cleared after the scanner is turned off and back on	CR does not move.	3-2
	Abnormal movement of CR, such as crashing into the frame.	3-3
	Lamp does not light.	3-4
"Communication Error" is indicated.	Error when Bi-directional parallel I/F is used.	3-5
	Error when the SCSI is used.	3-6
Scanned image is abnormal.	Black lines, White banding, and so on	3-7

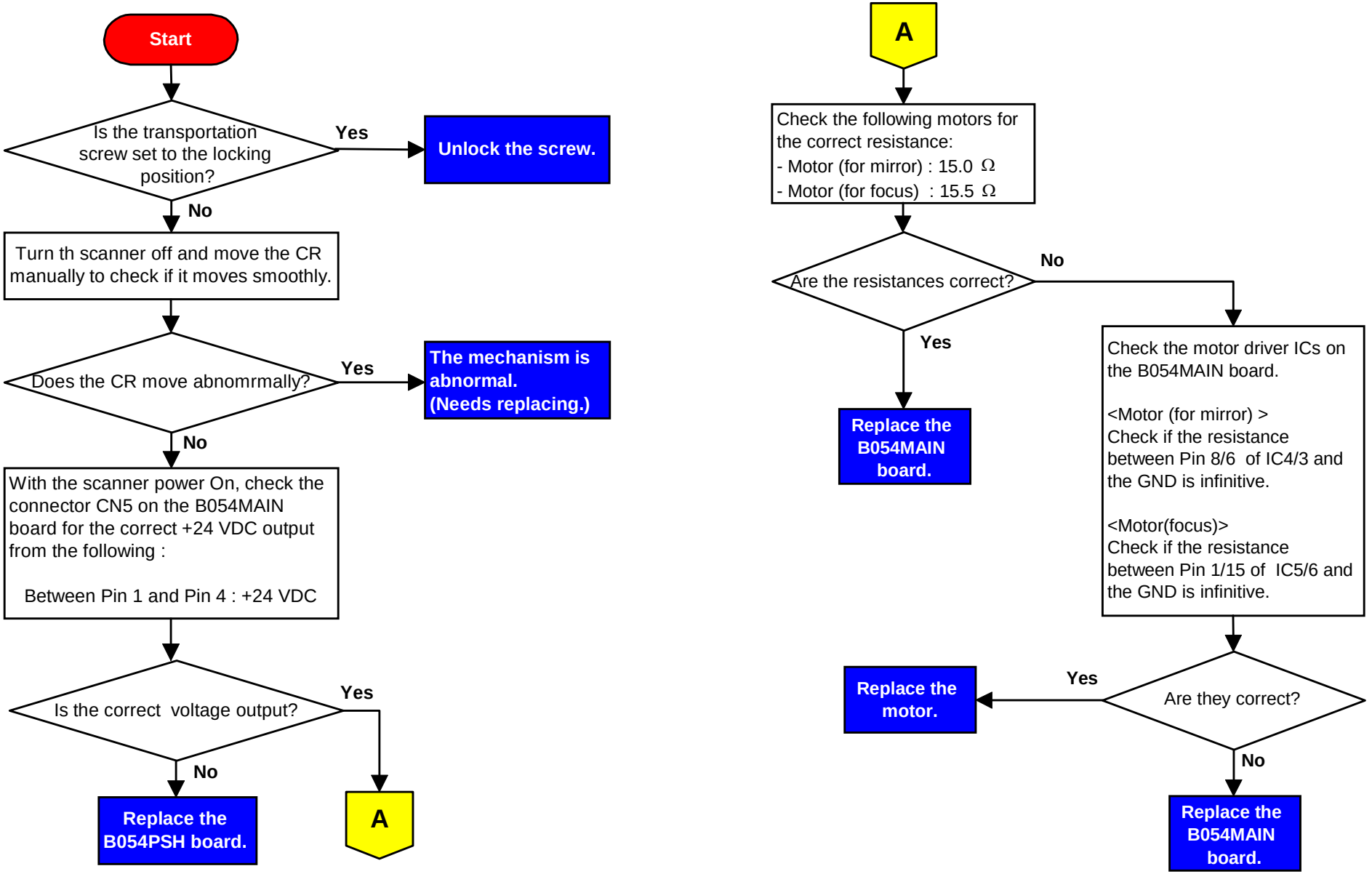
Check points for the major units listed for each phenomenon are shown in the following pages.

Flowchart 3-1
Phenomenon: "Operate" LED does not light.

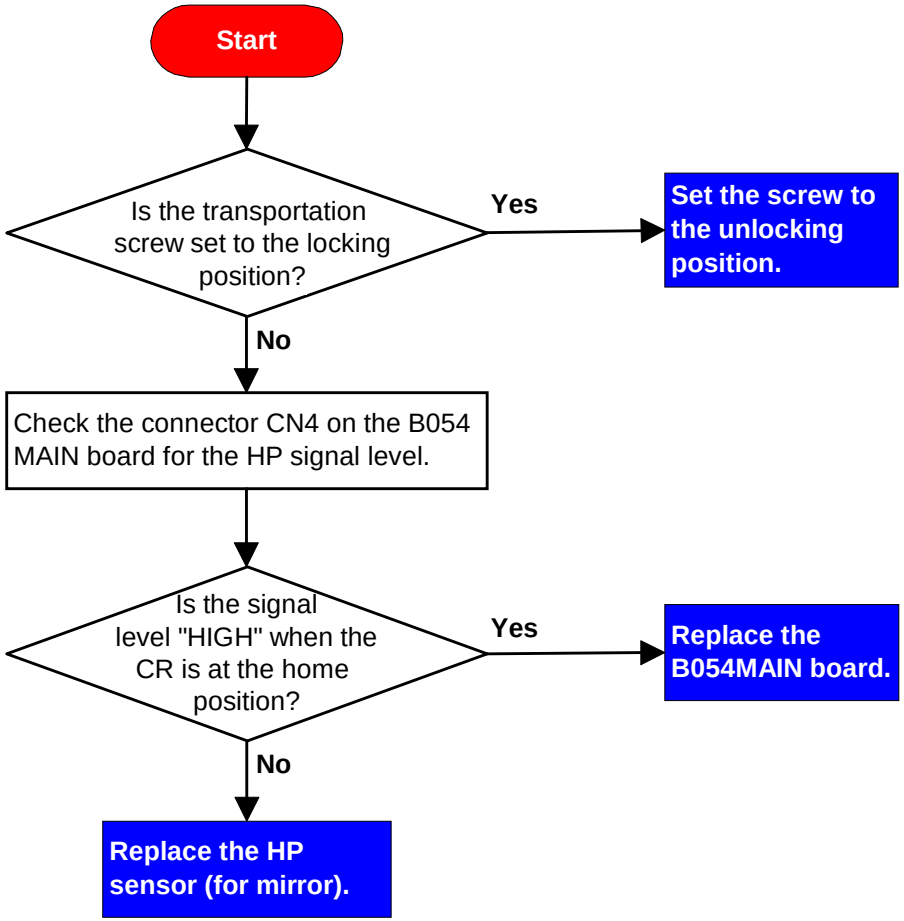




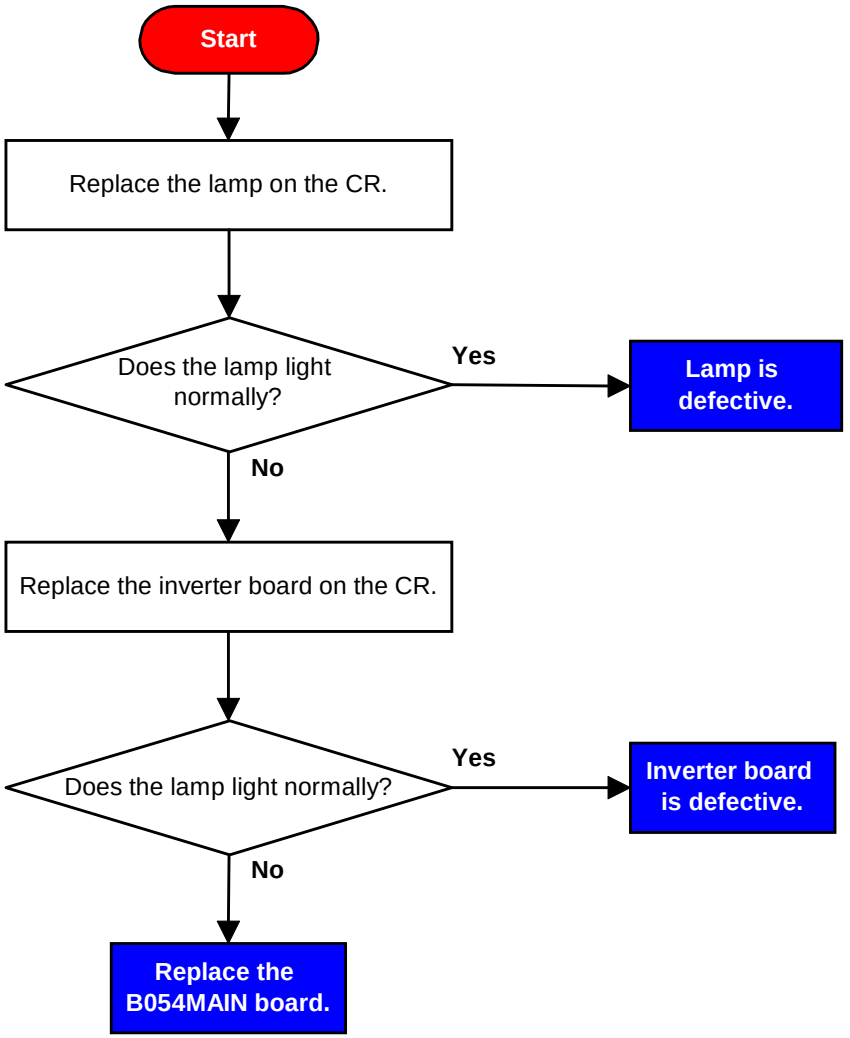
Flowchart 3-2
Phenomenon: CR (Mirror/Lamp) does not move.



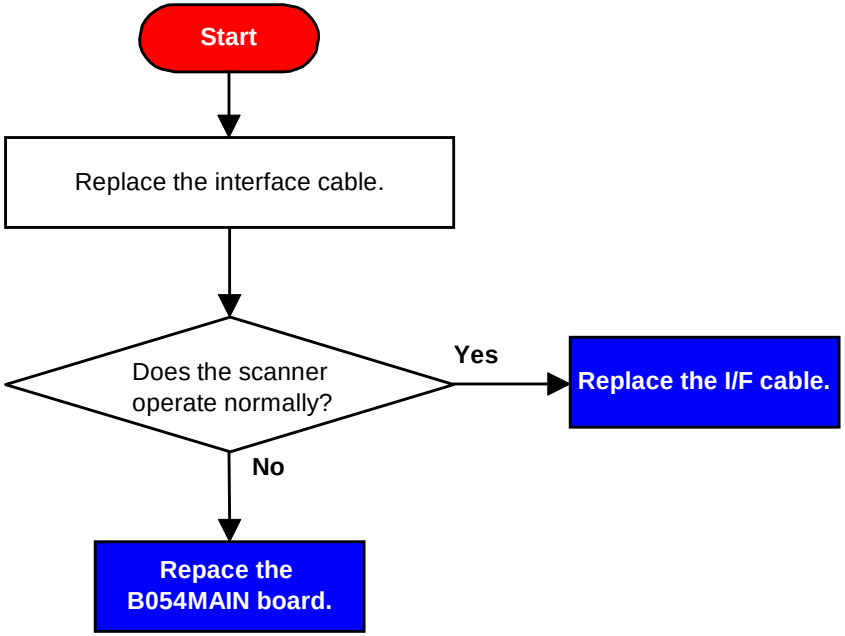
Flowchart 3-3
Phenomenon: CR moves abnormally. (Crashing into the frame)



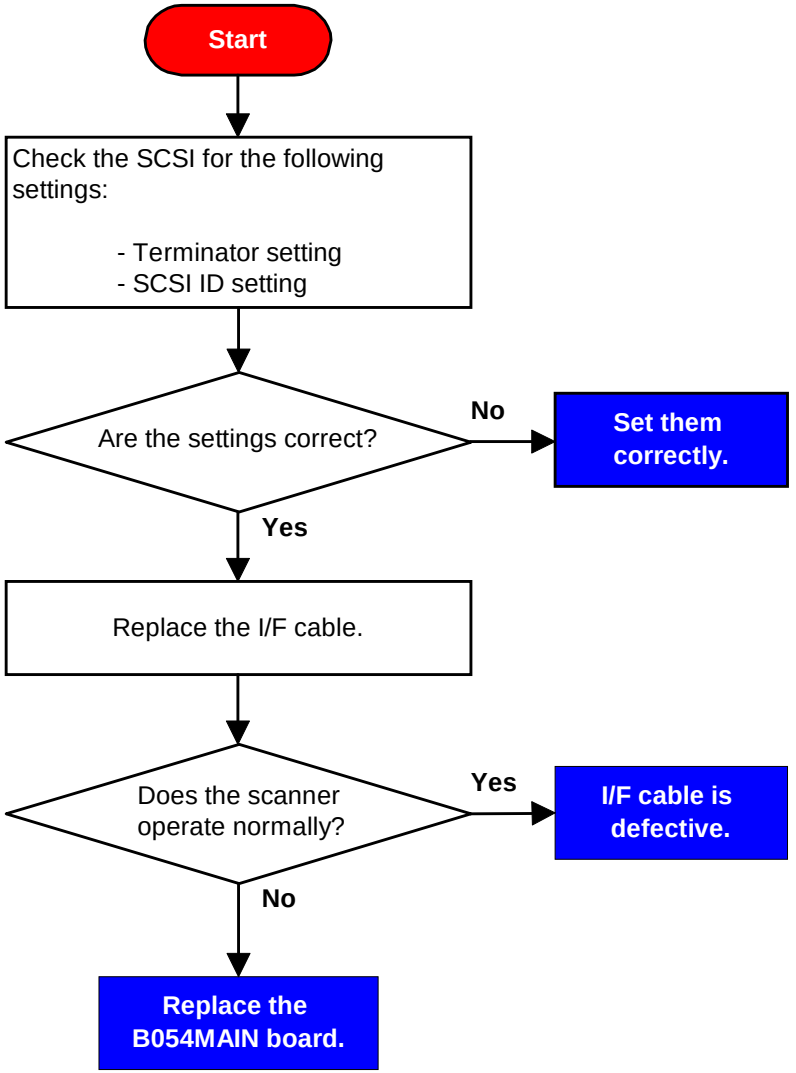
Flowchart 3-4
Phenomenon: Lamp does not light.



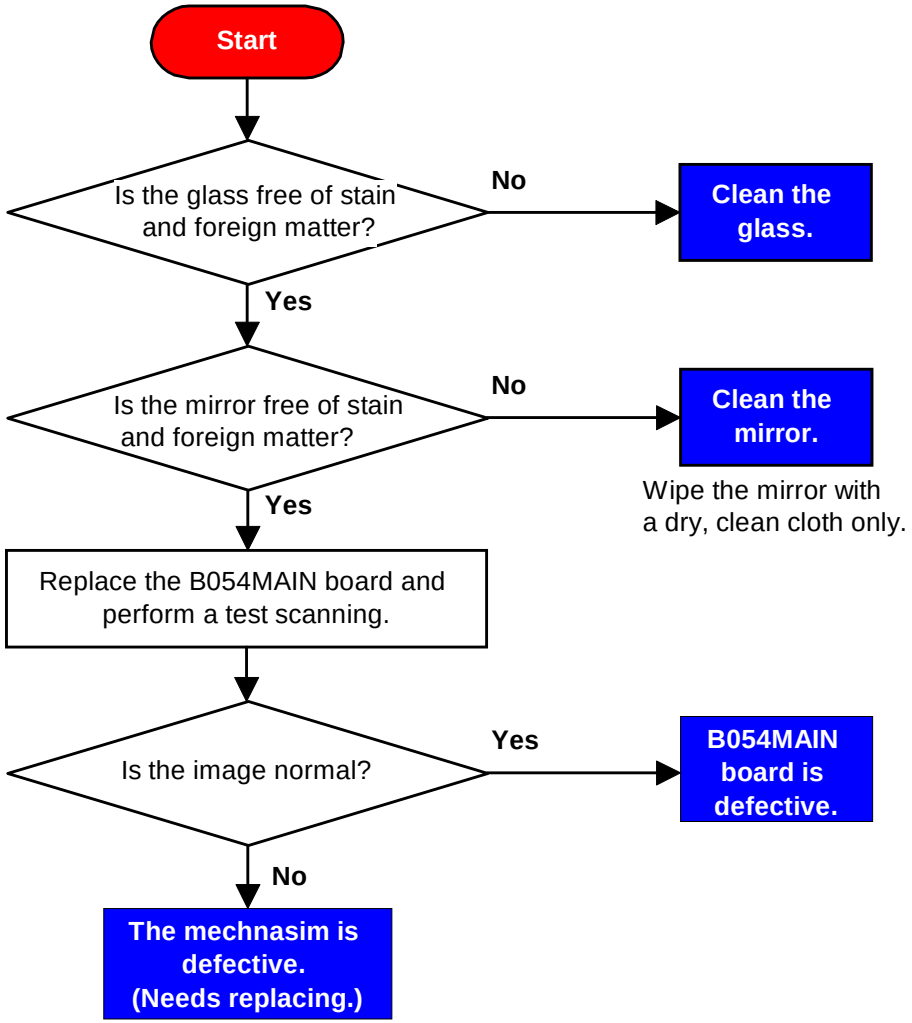
Flowchart 3-5
Phenomenon: "Communication Error" (Bi-directional I/F) is indicated.



Flowchart 3-6
Phenomenon: "Communication Error" (SCSI) is indicated.



Flowchart 3-7
Phenomenon: Scanned image is abnormal.



3.1.3 Troubleshooting for Electrical Circuit

This section describes the abnormal phenomenon and corresponding check points for each electrical circuit board.

3.1.3.1 Power Supply Board (B054PSH Board)

Phenomenon	Check Points
<Abnormal voltage> +5VDC is not output.	Check IC51 (TL494): • Signal waveform output from Pin 8/11 (chopping waveform)
<Abnormal voltage> +24 VDC is not output.	Check the Switching FET/Q1: • Waveform at the drain
<Abnormal voltage> +15 VDC in not output.	Check IC52 (78M15): • Signal waveform output from Pin 1

3.1.3.2 Control Circuit Board (B054MAIN Board)

Phenomenon	Check Points
<No operation at all> Reset IC is defective.	Check the reset IC (IC2) for the signal waveforms output from the following pins: • Pin 7 (for +5V input) • Pin 6 (for PWRES output)
<No operation at all> ROM access is bad.	Check the CPU (IC13) for the ROM access signal waveforms output from the following pins: • Pin 104 (for CS0 signal) • Pin 78 (for RD signal)
<No operation at all> CPU is defective.	Check the clock signal waveform input to the following pin: • Pin 75 (for XTAL input)

Phenomenon	Check Points
<"Fatal Error"> Motor (for mirror) driver circuit is defective.	Check the Driver IC (IC3/4: • Phase drive signal waveform output from Pin 8/6
<"Fatal Error"> Motor (for focus) driver circuit is defective.	Check the driver IC (IC5/6): • Phase drive signal waveform output from Pin 1/15
<"Fatal Error"> CR does not stop at the home position.	• Check if the signal waveform input to Pin 91 of CPU (IC13) changes in accordance with the CR position.
<"Fatal Error"> Lamp does not light.	Check the following for the lamp signal output: • Output from Pin 166 of ASIC (IC24) • Emitter waveform at Tr (Q1)
<"Fatal Error"> White standard level is not read properly.	Check ASIC (IC28): • Signal waveform output from Pin 161
<"Communication Error"> Bi-directional I/F / SCSI I/F	Main cause: ASIC (IC28) is defective. (Replace IC28 or B054MAIN board.)
<Image is read abnormally>	Main cause: ASIC (IC24) is defective. (Replace IC24 or B054MAIN board.)

CHAPTER

4

DISASSEMBLY AND ASSEMBLY

4.1 OVERVIEW

This chapter describes how to disassemble this scanner. Unless otherwise specified, assembly can be accomplished by following disassembly procedures in reverse order.

⚠WARNING

- ***Be sure to disconnect the power cable from the AC power socket prior to servicing.***
- ***Since this scanner weighs heavy (approximately 20 Kg), it must be carried by 2 people.***

⚠CAUTION

- ***Never disassemble any scanner parts unless specified to do so, because this scanner mechanism needs assembling and adjusting rather exactly to preserve accurate control system at its satisfactory level.***
- ***Get yourself enough room for servicing, considering the size of the scanner.***
- ***Since this scanner weighs as heavy as approximately 20 kg, be sure to perform servicing on a heavy-duty, level table.***
- ***Make sure that the "CR fixing knob" is set to the locking position to fix the CR by the rear before packing the scanner.***

4.1.1 Tools

Tools used for servicing are as listed in the table below:

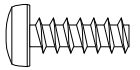
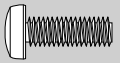
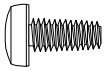
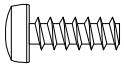
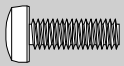
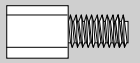
Table 4-1 .Tool List

Description	Availability	SE Part No.
Exclusive adjusting tools (Leveling tools)	EPSON exclusive	Code: 1039140
Phillips screw driver (No.2)	○	–
Standard screw driver (No.1)	○	–
Tweezers	○	–

4.1.2 Screws

Screws used in this scanner are listed in the table below. Be sure to use the correct types and numbers of screws for each part when assembling the scanner.

Table 4-2. Screw List

No.	Screw Type / Specification	Appearance	Color
1	CBP M4x12		Silver
2	CB M4x10		Gold
3	CBS M3x6		Red copper
4	CB M3x4		Gold
5	CBP M3x8		Gold
6	CB M3x6		Gold
7	CB M3x12		Black
8	CR;B damper shaft (Thread part: M3x3)		Gold
9	CP M3x6		Silver
10	Screw lock screw (Diagonal: 5 mm)		Silver

4.2 DISASSEMBLY PROCEDURES

This section describes disassembling and removing procedures for each major unit of the scanner.

See the flowchart in Figure 4-1. The jobs in the yellow boxes involve using the adjustment tools exclusively designed for this scanner. Therefore, make sure that you read the instruction for the section to refer to carefully to figure out the procedure before servicing.

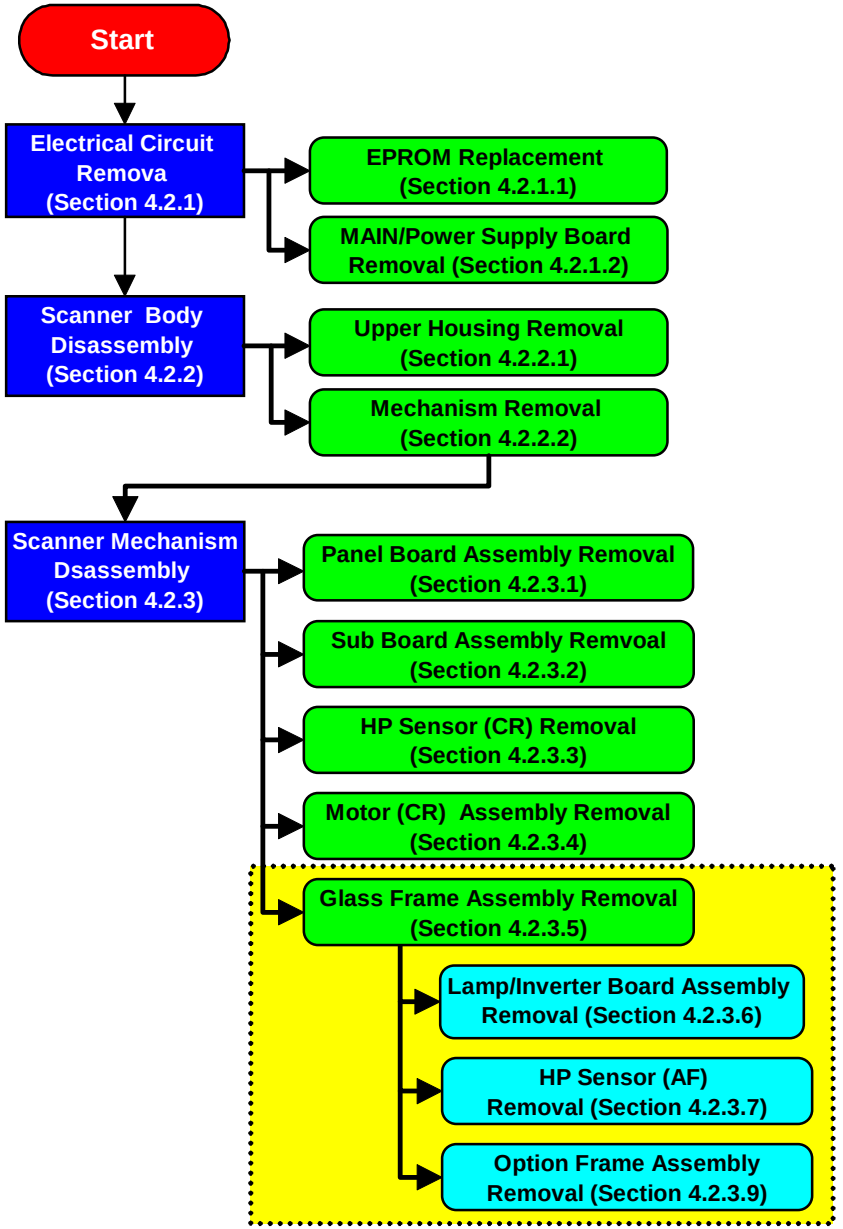


Figure 4-1. Procedure for Disassembling the GT-12000

4.2.1 Electrical Circuit Removal

The major electrical circuit boards (B054MAIN and B054PSH) of this scanner are all stored in one independent shield compartment. Therefore, they can be removed in one unit (board unit) from the scanner with ease.

1. Disconnect the AC power cable from the scanner.
2. Remove 3 screws (No.5) securing the shield compartment which contains the electrical circuit boards at the back of the scanner. Then take out the compartment from the scanner to remove.

✓CHECK POINT ***For easy removal, insert a driver or equivalent into the bail lock of the interface and pull it.***

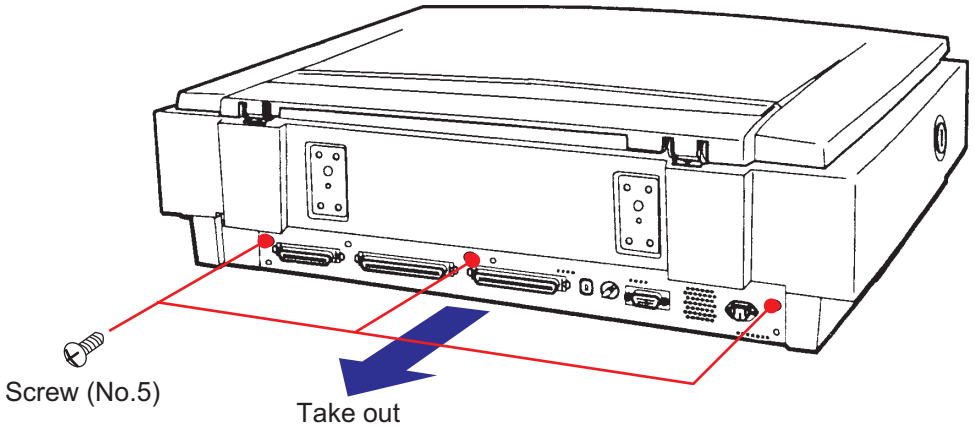


Figure 4-2. Shield Compartment Removal

4.2.1.1 EPROM Replacement

In case of EPROM replacement, remove the ROM cover attached on the board unit.

1. Remove the board unit. (See Section 4.2.1.)
2. Remove 1 screw (No.3) fixing the ROM cover, and remove the cover.
3. Remove the EPROM from the IC socket and install a new EPROM.

⚠CAUTION ***When installing the ROM, make sure that the leads are not bent and the ROM is installed in the right direction.***

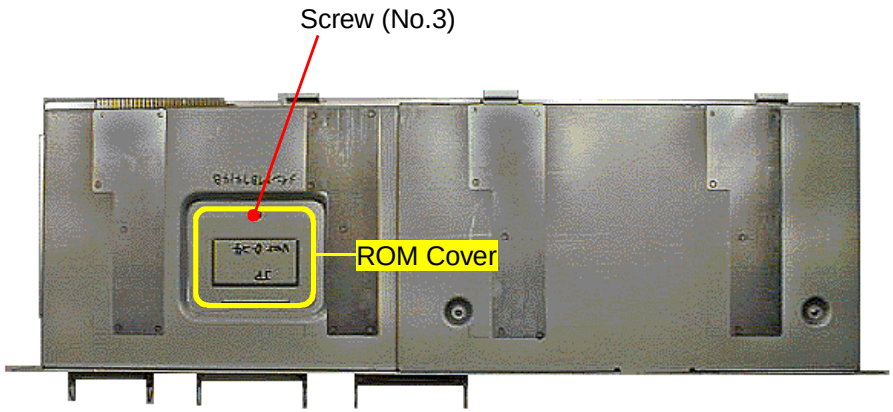


Figure 4-3. ROM Cover Removal

4.2.1.2 MAIN/B054PSH Board Removal

B054MAIN and B054PSH boards stored in the shield compartment are removed in the following procedure:

1. Remove the shield compartment. (See Section 4.2.1.)
2. Remove 12 screws (No.3) securing the top shield of the board unit, then remove the top shield.

3. ***[MAIN board assembly removal]***
   Disconnect the connector cables from the connector CN5 and CN9 on the MAIN board.
4. Remove the following screws securing the MAIN board, and remove the MAIN board:

   - 6 screws (No.3): Fixing the board along the edges.
   - 6 screws (No. 9): Securing the I/F connector.
   - 2 screws (No.10): Securing the optional I/F connector.

   .

5. ***[Power supply board assembly removal]***
   Remove the connector cables from the connector CN1 on the power supply board assembly and the connector CN5 on the MAIN board assembly.
6. Remove 6 screws (No.3) securing the power supply board assembly and remove the power supply board.

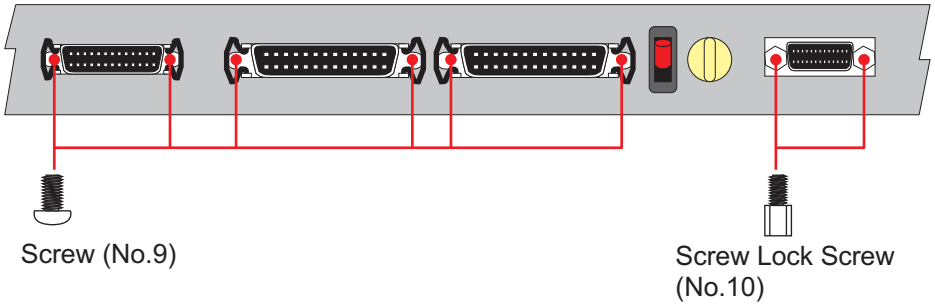


Figure 4-4. I/F Connector Fixing Screw Removal

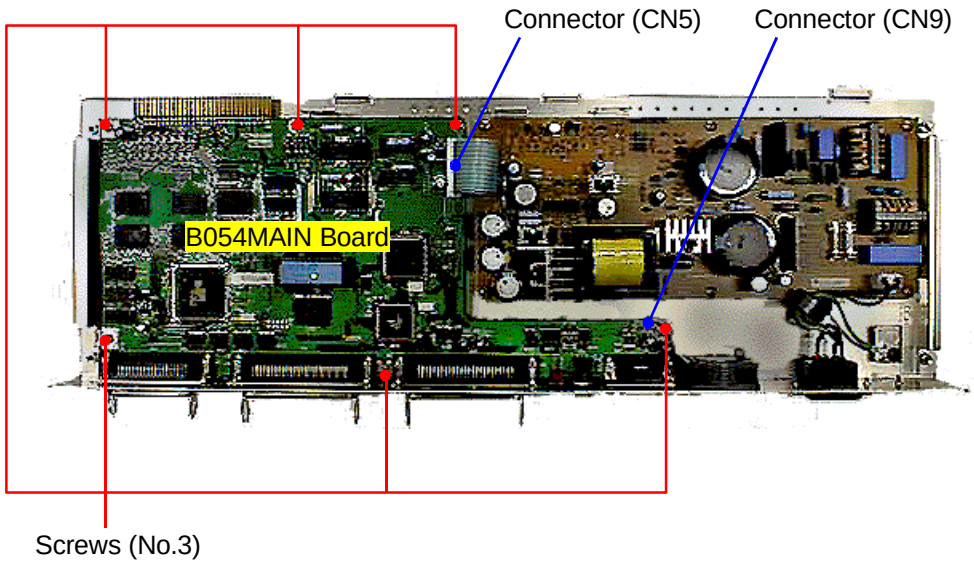


Figure 4-5. MAIN Board Removal

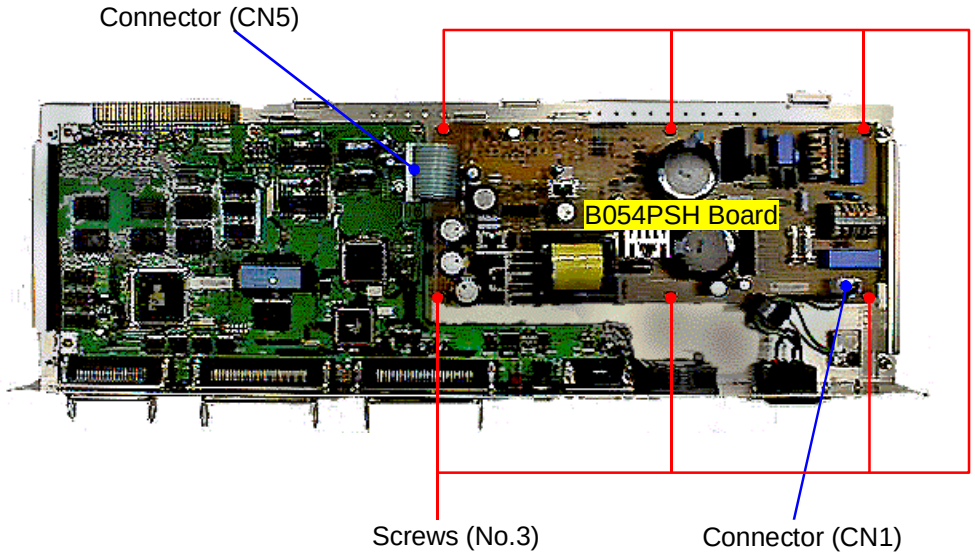


Figure 4-6. Power Supply Board Removal

4.2.2 Scanner Body Disassembly

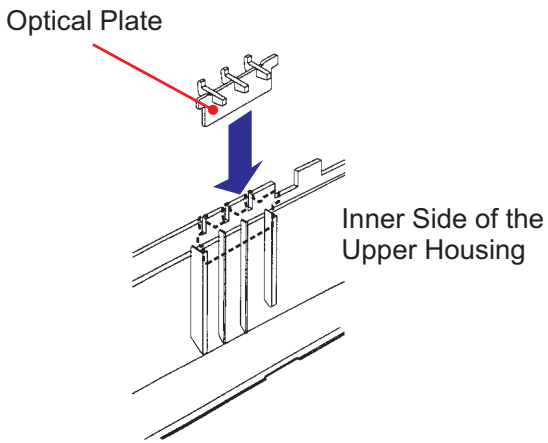
This section describes procedures for disassembling the major units of the scanner.

⚠CAUTION ***When removing the CR fixing knob or screw caps, be careful not to damage the upper housing.***

4.2.2.1 Upper Housing Removal

1. Remove the document cover.
2. Using tweezers, remove the CR fixing knob attached to the left side of the scanner.
3. Remove 4 screws (2 for each of No1 and No.2) securing the upper housing to the chassises on the scanner. Note that the front 2 screws are covered with the screw caps. Using tweezers, pinch them out prior to removing the screws.
4. Lift up the upper housing to remove it.

✓CHECK POINT ***When installing the upper housing, make sure that the optical plate is installed on the specified position.***



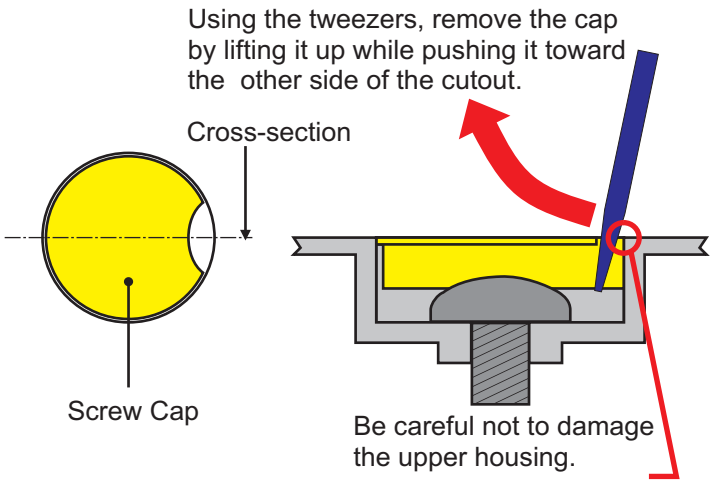


Figure 4-7. Screw Cap Removal

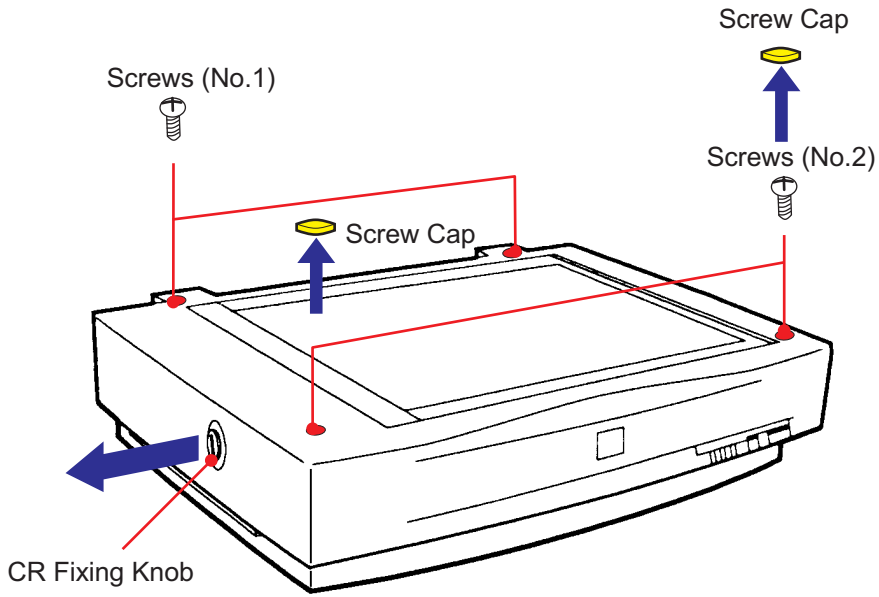


Figure 4-8. Upper Housing Removal

4.2.2.2 Scanner Mechanism Removal

The scanner mechanism can be removed from the lower housing in the following procedure:

1. Remove the upper housing. (See Section 4.2.2.1.)
2. Remove 4 screws (No.1) securing the scanner mechanism to the lower housing at the bottom. Then remove the mechanism from the lower housing.

✓CHECK POINT

- ***Note the following when installing the scanner mechanism:***
  - ***1) Remove the key tops for the power switch and reset switches from the lower housing.***
  - ***2) Install the scanner mechanism to the lower housing.***
  - ***3) Reinstall the key tops.***
- ***Place the removed mechanism on flat stable surface.***

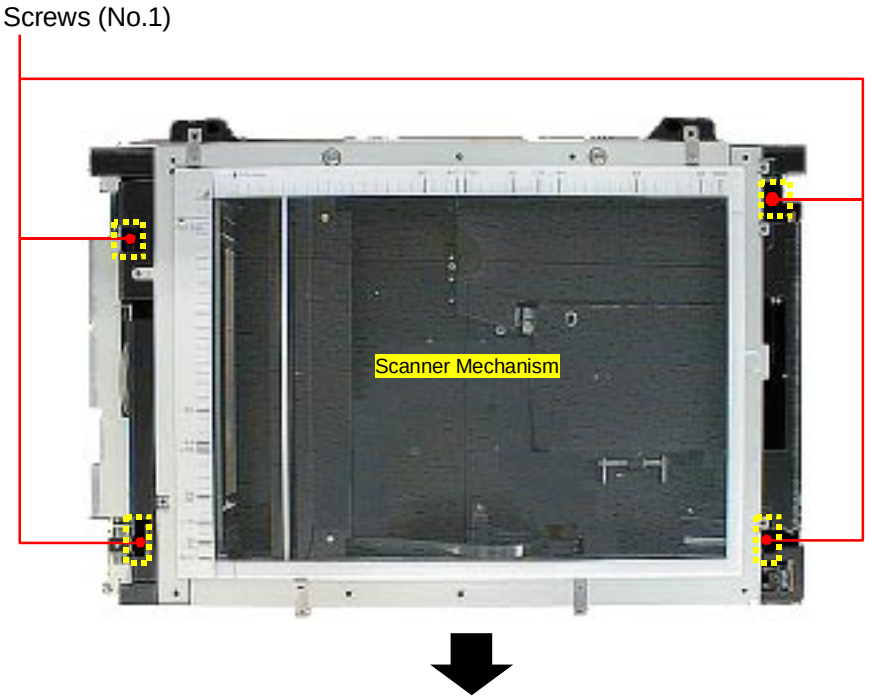


Figure 4-9. Scanner Mechanism Removal

4.2.3 Scanner Mechanism Disassembly

The rest part of the chapter describes the procedures for removing the major parts/units in the scanner mechanism.

⚠CAUTION

Note that producing this scanner requires rather precise assembly and adjustment to ensure accurate control system. Therefore, never disassemble any scanner parts unless specified to do so.

4.2.3.1 Panel Board Assembly Removal

1. Remove the scanner mechanism. (See Section 4.2.2.2.)
2. Turn the mechanism over and place it on a flat surface.
3. Disconnect all connector cables from the panel board assembly.
4. Remove 2 screws (No.6) securing the panel board assembly and remove it.

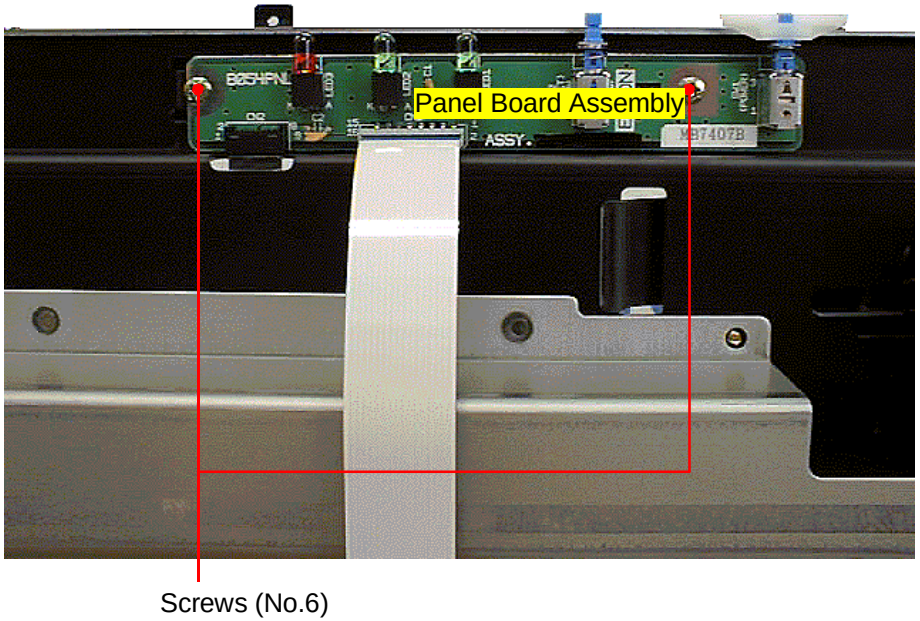
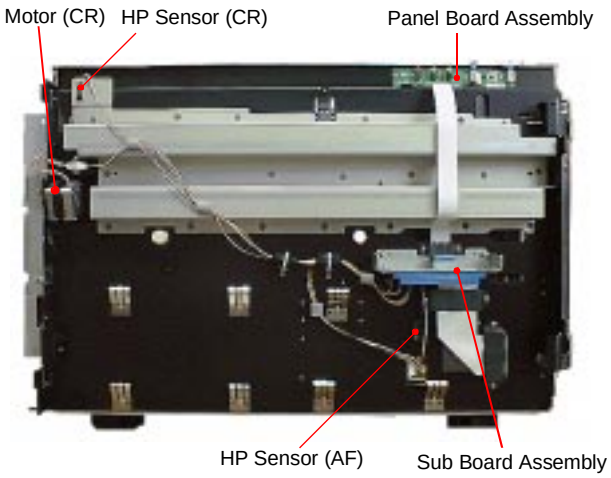


Figure 4-10. Panel Board Assembly Removal

✓CHECK POINT

Unit arrangement at the bottom of the mechanism is as shown below.



4.2.3.2 Sub Board Assembly Removal

1. Remove the scanner mechanism. (See Section 4.2.2.2.)
2. Turn the mechanism over and place it on a flat surface.
3. Disconnect all connector cables from the sub board assembly (B054SUB board).
4. Remove 2 screws (No.3) securing the board to the bracket and remove the sub board.

✓CHECK POINT

When placing the scanner up side down, lay a clean soft cloth under the scanner to protect the glass surface.

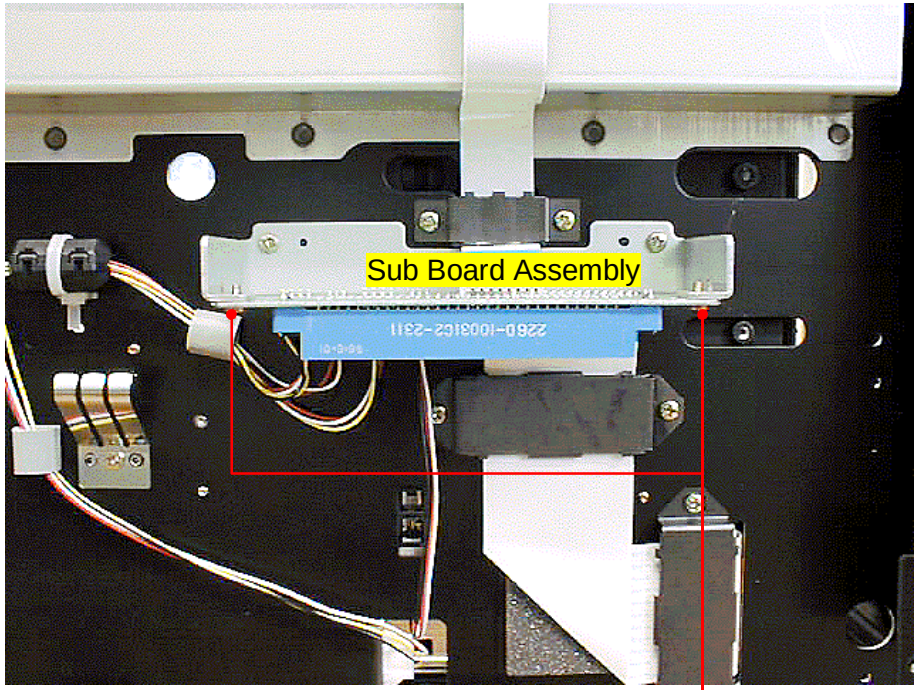


Figure 4-11. Sub Board Assembly Removal

4.2.3.3 HP Sensor (CR) Removal

This section describes procedure for removing the HP sensor which detects the reference position for the carriage mirror assembly.

1. Remove the scanner mechanism. (See Section 4.2.2.2.)
2. Move the carriage mirror assembly away from the HP (home position).
3. Turn the mechanism over and place it on a flat surface.
4. Release the hook fixing the HP sensor at the bottom of the mechanism and remove the HP sensor unit. Then disconnect the connector cable from the removed HP sensor.

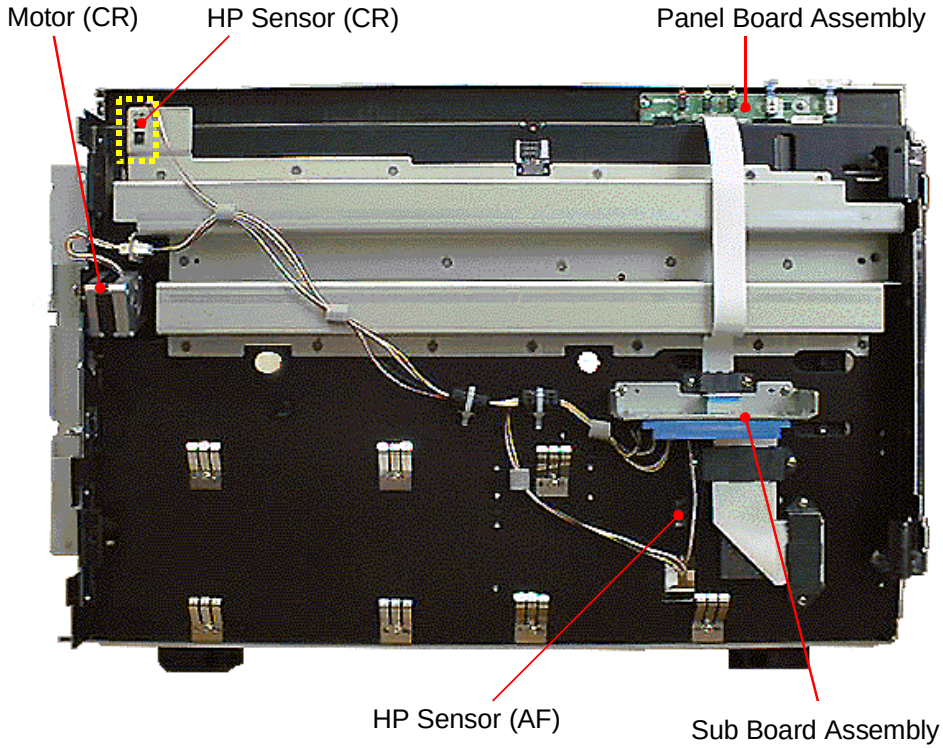


Figure 4-12. HP Sensor (CR) Removal

4.2.3.4 CR Motor Assembly Removal

This section describes procedure for removing the motor unit which drives the carriage mechanism (mirror/lamp).

1. Remove the scanner mechanism. (See Section 4.2.2.2.)
2. Turn the mechanism over and place it on a flat surface.
3. Unhook the torsion spring from the tension lever assembly, then remove 1 screw (No.6) to remove the tension lever assembly.
4. Disconnect the cable for the motor from the relay connector and remove 4 CR damper shafts; B (No.8) securing the motor, then remove the motor.

✓CHECK POINT ***When assembling, hook the spring to the tension lever assembly first, then fasten the screw.***

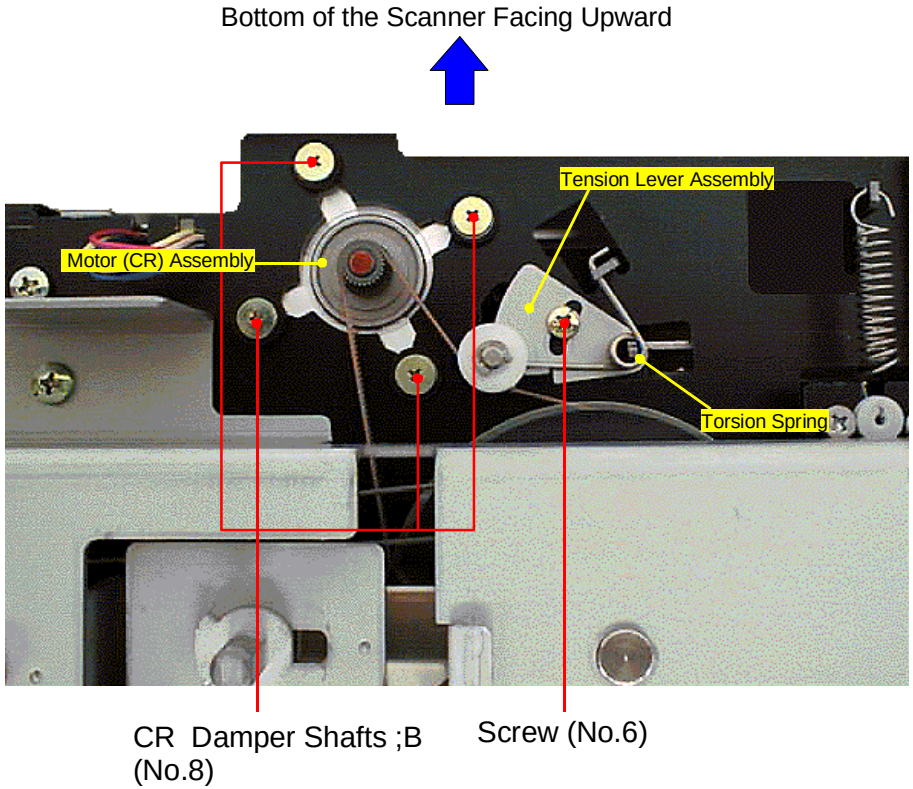


Figure 4-13. CR Motor Assembly Removal

4.2.3.5 Glass Frame Assembly Removal and Pre-operation

Since the glass frame assembly is one of the reinforcing parts of the mechanism, whole mechanism may be deformed if it is removed. Be sure to follow the instruction provided in this section during any service which involves removing the glass frame assembly.

⚠CAUTION

Be aware the following when removing the document glass during any service:

- ***Always set the scanner on the adjusting tools exclusively designed for this scanner.***
- ***Set the scanner on a stable, level table.***
- ***Make sure that the scanner mechanism is installed to the lower housing while servicing.***
- ***Be sure to fit all the rubber foot at the bottom of the scanner in the top indents of the stages and the adjuster. (Any of the foot must not be placed over the top surface of the tool.)***

1. Remove the upper housing. (See Section 4.2.2.1.)
2. Refer to the figures in the right column and set the adjusting tools (leveling tools) under the scanner to level the scanner, as instructed below:
   1) Set the scanner on 3 stages, making each of the specified feet of the scanner sit on the corresponding stage.
   2) Set the adjuster under the rubber foot in the front right corner of the scanner bottom, aligning the center of the adjuster with the one of the rubber foot. Make sure that you can see the groove on the adjuster when it is set.
   3) Hold the base of the adjuster with a hand and spin the table to make it reach the bottom of the scanner by its own forth.
   4) Turn the table **[2 quarters]** manually, which can be measured by 4 divisions on the table and the groove on the base, to push the table up from the position where the table was moved up to by the spin.
   5) After adjusting, make sure that each corner of the scanner is securely in contact with the corresponding tool.

***Note**: Directions are described when the scanner is viewed from the front.*

<*Continued to the next page.*>

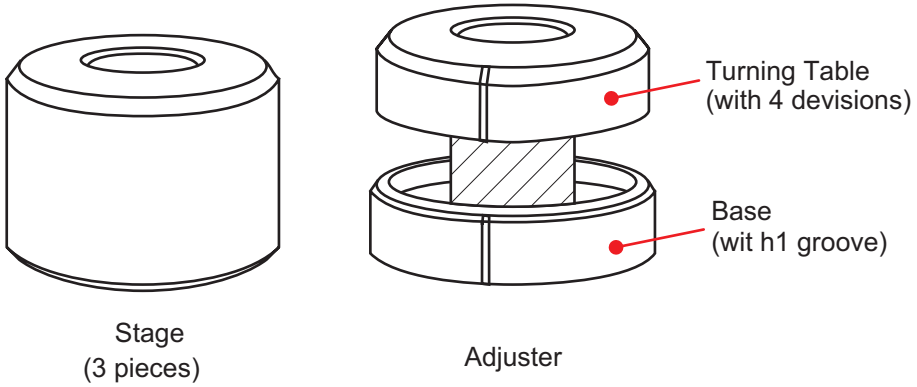


Figure 4-14. Adjusting Tools

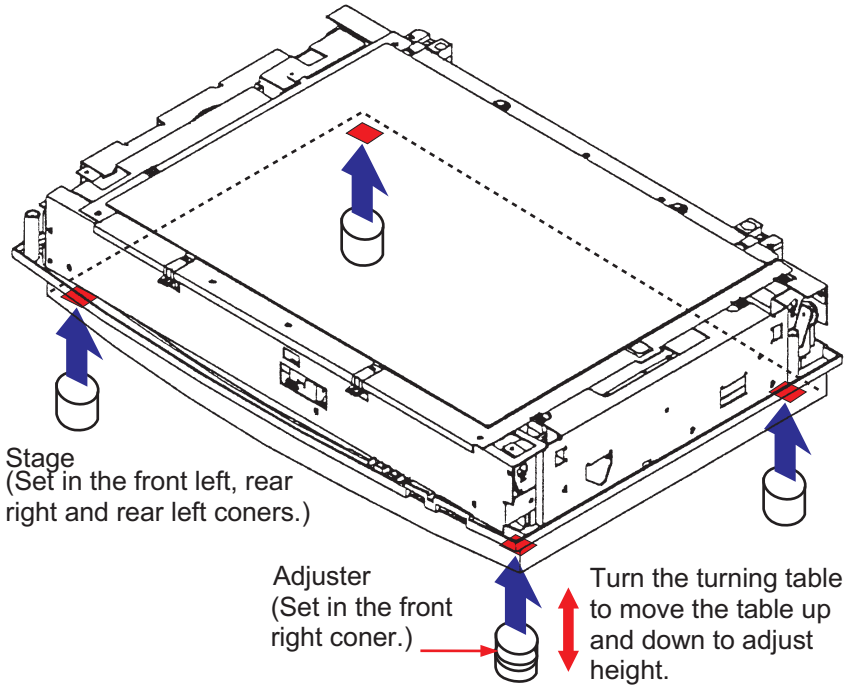


Figure 4-15. Tool Position and Adjusting Method

3. Remove 9 screws and remove the glass frame assembly. The screws to be removed and their locations are as follows:

   - No.4: 5 screws securing the glass frame assembly by the right and left sides.
   - No.1: 2 screws securing the glass frame assembly by the rear edge.
   - No.3: 2 screws securing the glass frame assembly by the front edge.

   ***Note**: Directions are described when the scanner is viewed from the front.*

⚠CAUTION ***When reinstalling the glass frame assembly, refer to Section 4.2.3.5.1 to set the glass frame assembly on the correct position. Failure in this operation will cause the CR to start scanning at a wrong position.***

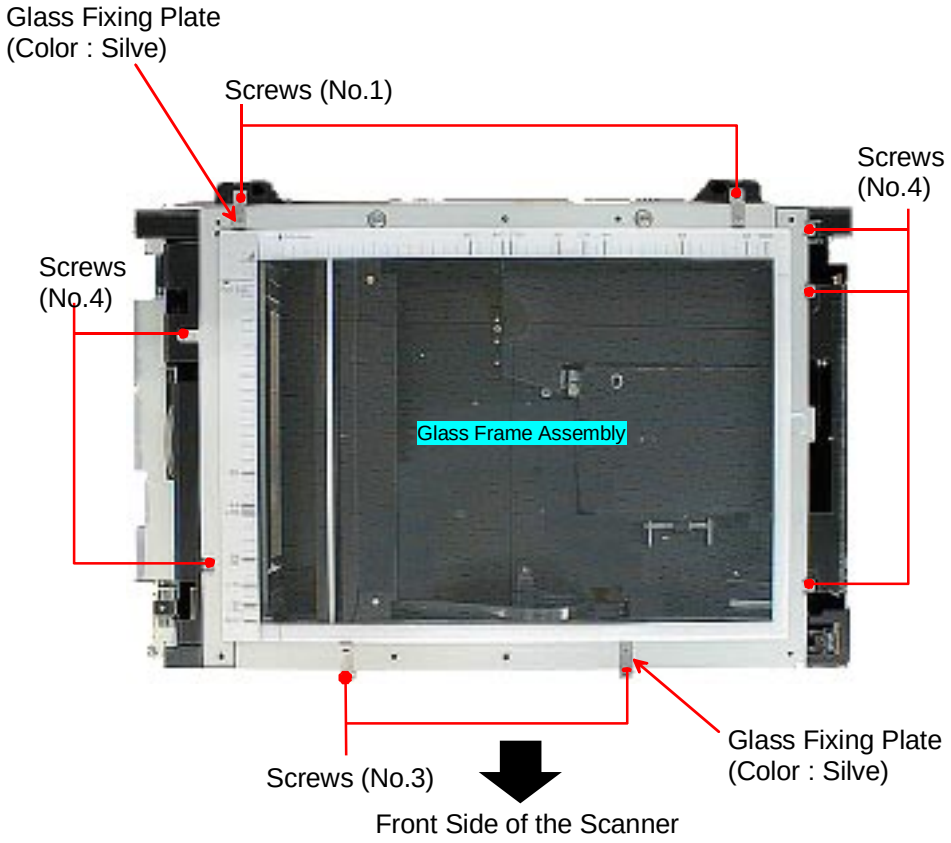


Figure 4-16. Glass Frame Assembly Removal

4.2.3.5.1 Glass Frame Assembly Installation

After the glass frame assembly has been removed for any purpose, it must be reinstalled in the following procedure.

1. Place the glass frame assembly to the specified position in the scanner mechanism.
2. Referring to the Figure 4-17, determine the installation position for the glass frame assembly.

    1) Push the whole glass frame assembly from the front against the positioning bushes (color: silver) on the top side of the rear frame. (Glass edge is in contact with the bushes with this operation.)
    2) Keeping the glass frame assembly in contact with the bushes, move the assembly left to push it against the positioning bump on the top surface of the left side frame.
3. When the glass frame assembly is correctly positioned, fix it with 9 screws.

✓CHECK POINT ***When installing the glass frame assembly, ensure that 4 glass fixing plates are properly positioned. (See Figure 4-16.)***

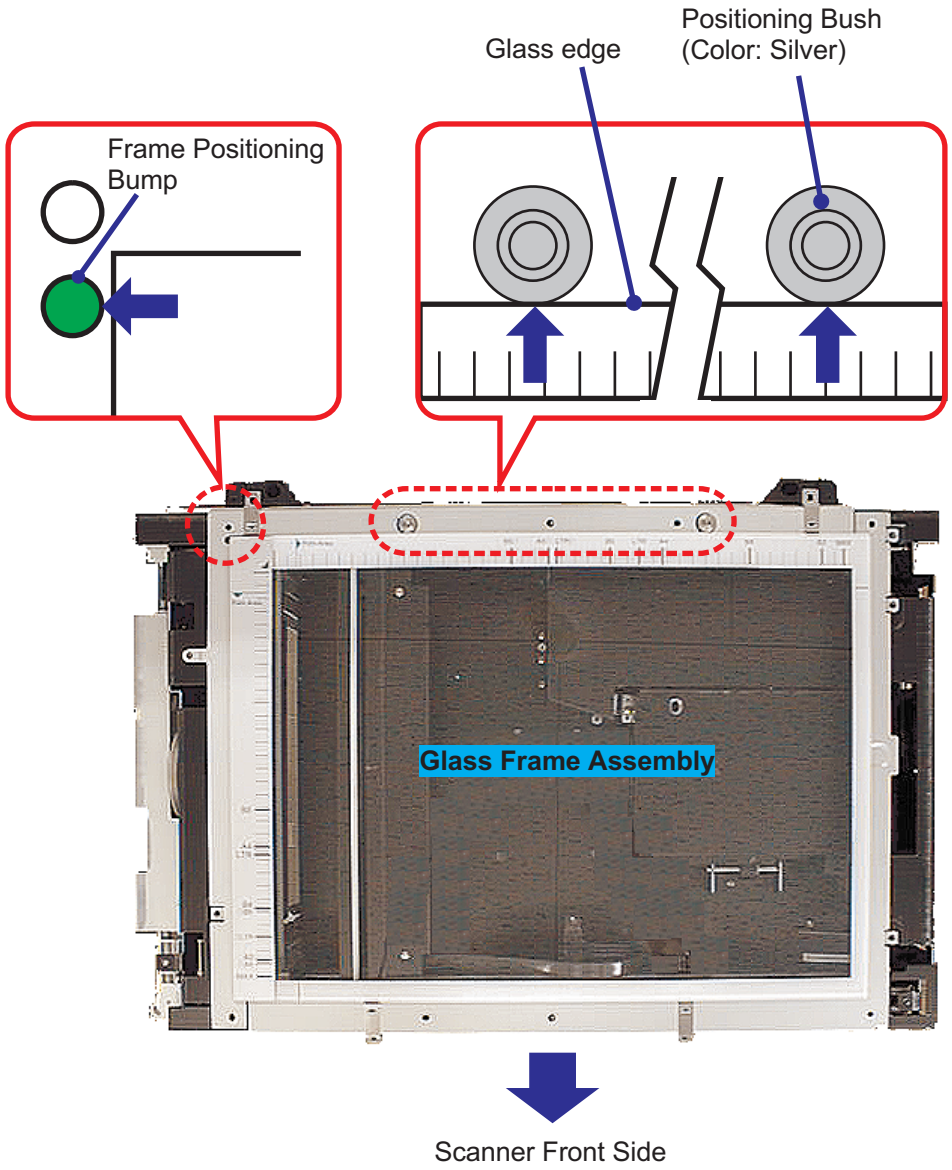


Figure 4-17.
Determining the Glass Frame Assembling Installation position

4.2.3.6 Lamp Assembly and Inverter Board Assembly Removal

This section describes how to remove the lamp assembly and the inverter board assembly from the carriage.

1. Remove the glass frame assembly. (See Section 4.2.3.5.)
2. Move the CR to the position indicated in Figure 4-19. (The position where the front and rear frames are indented.)
3. Remove 2 screws (No.6) securing the carriage mirror cover and slide the cover toward the rear side of the scanner to release the engagement with the hook on the carriage. Then lift up the cover and remove it.

<Continued to the following page.>

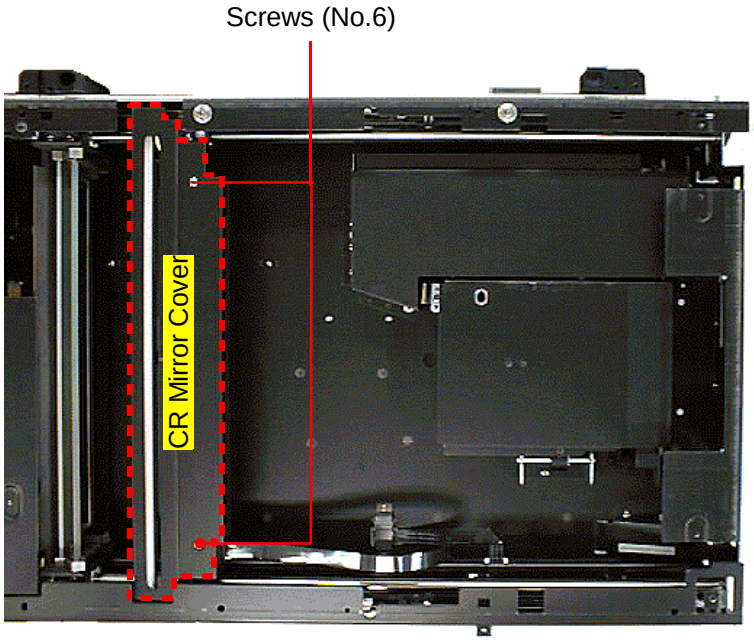
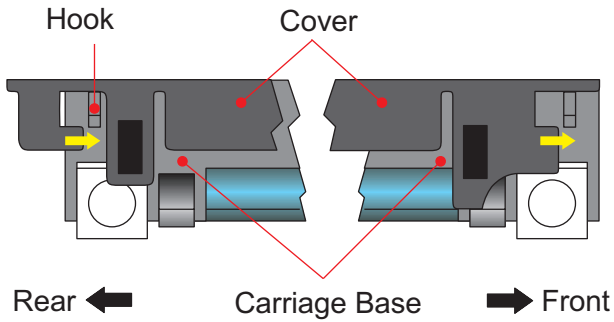


Figure 4-18. CR Mirror Cover Removal

4. Disconnect the connector cable for the lamp from the connector CN2 on the inverter board assembly. Then remove the lamp from the carriage.
5. Disconnect the cable (black) from the connector CN1 on the inverter board assembly. Then remove the bracket (silver) fixing the ferrite core.
6. Remove 2 screws (No.6) securing the inverter board assembly.
7. Slide the inverter board assembly toward the front side of the scanner to release the engagement with the hook on the carriage. Then remove the inverter board.

✓CHECK POINT

When assembling, make sure that the cover is securely engaged with the hook on the carriage.



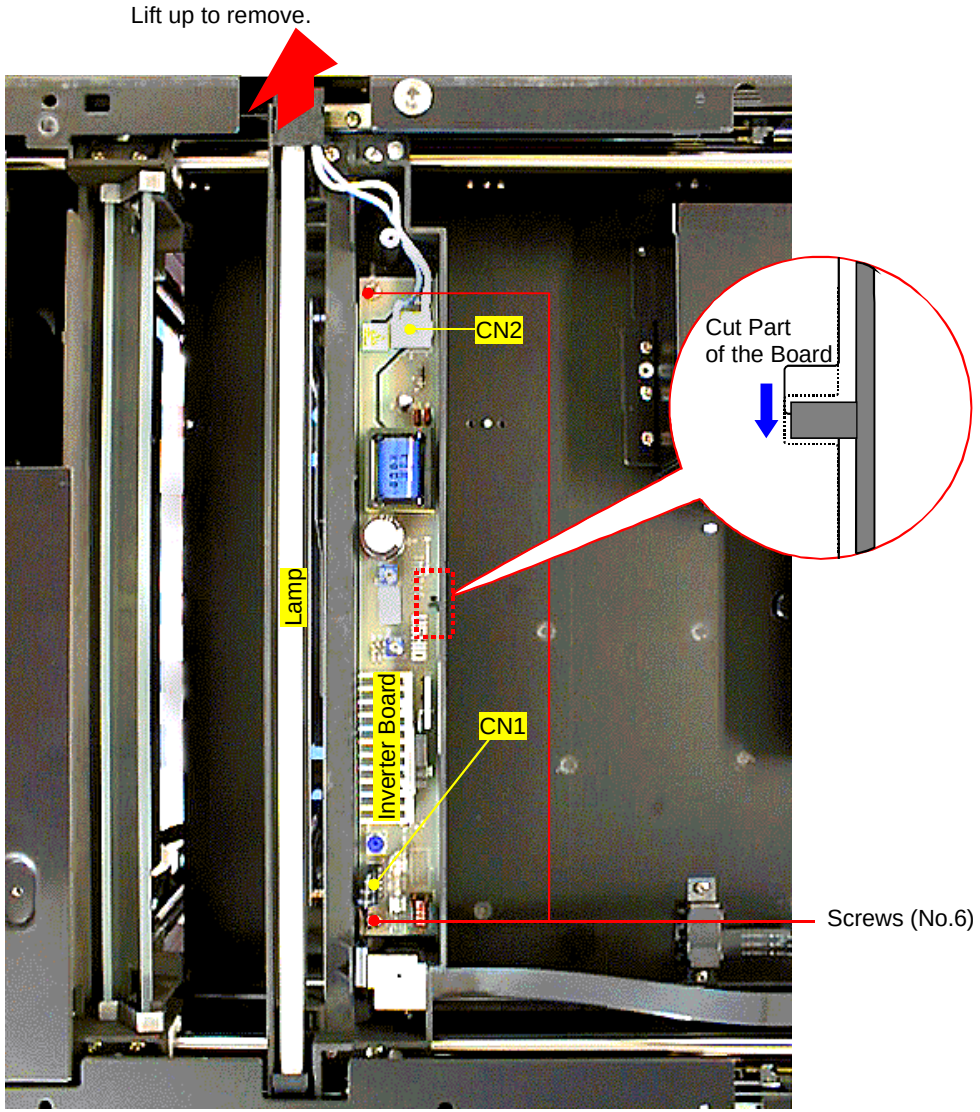


Figure 4-19.
Lamp Assembly and Inverter Board Assembly Removal

4.2.3.7 HP (AF) Sensor Removal

This section describes the procedure for removing the HP sensor which detects the reference position for the AF drive mechanism (lens/CCD sensor unit).

1. Remove the glass frame assembly. (See Section 4.2.3.5.)
2. Remove 4 screws (No.3) securing the AF drive mechanism cover which covers the AF drive mechanism and remove the cover.
3. Rotate the screw pulley at the end of the screw shaft (a thread shaft) manually to move the detection flag to the area where it does not overlap with the HP sensor.
4. Release the hook fixing the HP sensor and remove it, then disconnect the cable from the sensor.

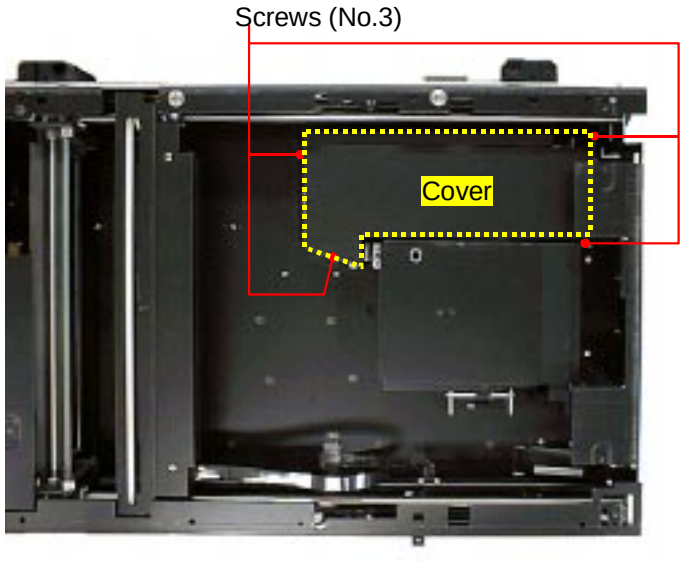


Figure 4-20. AF Drive Mechanism Cover Removal

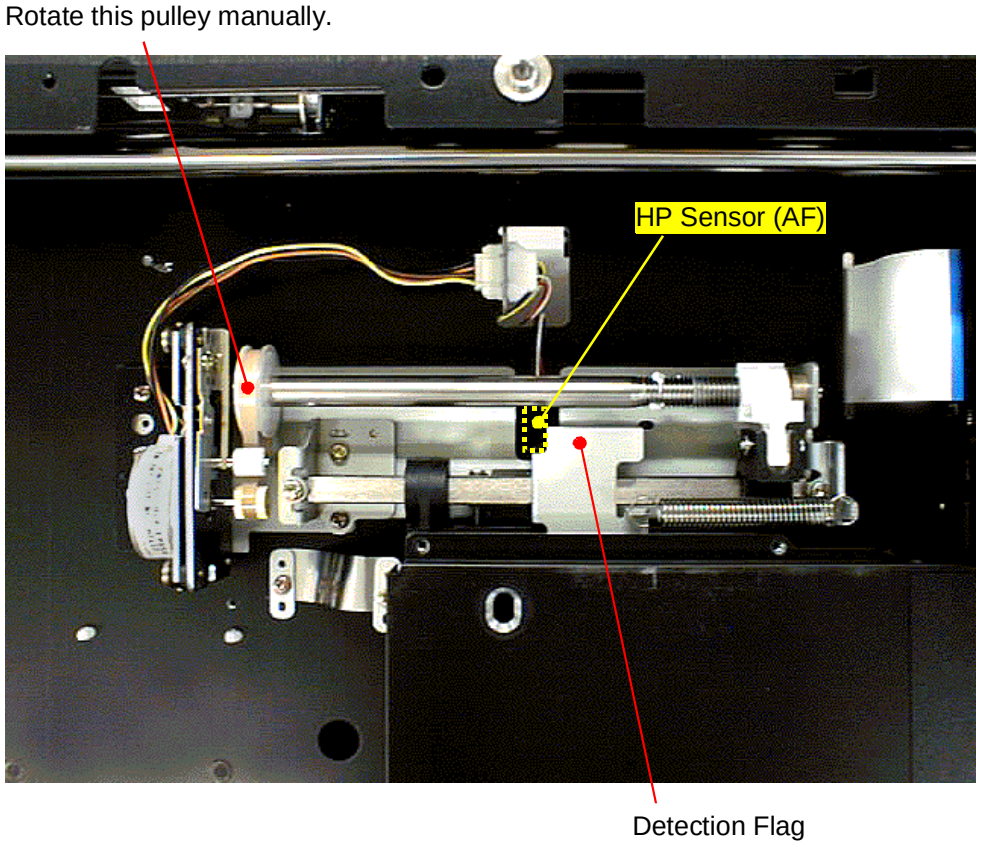


Figure 4-21. HP Sensor (AF) Removal

4.2.3.8 AF Motor Assembly Removal

This section describes how to remove the motor which drives AF drive mechanism.

1. Remove the glass frame assembly. (See Section 4.2.3.5.)
2. Remove 4 screws (No.3) and remove the cover which covers the AF drive mechanism.
3. Remove 2 screws (No.6) and remove the tension plate assembly, spring plate and fixing tension plate to loosen the timing belt.
4. Disconnect the cable for the motor from the relay connector, then remove 4 screws (No.4) securing the motor and remove the motor.

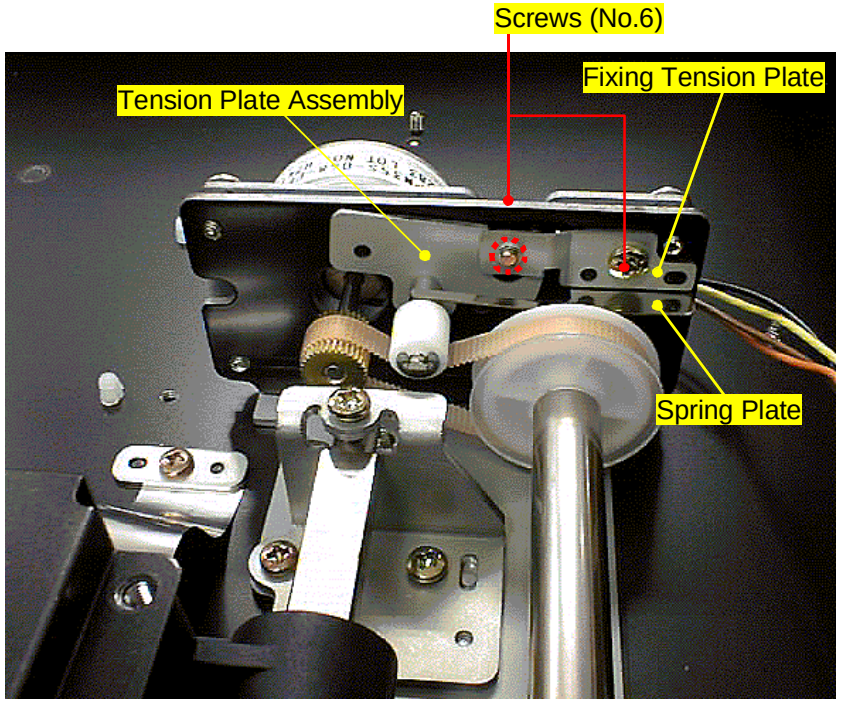


Figure 4-22. Tension Plate Assembly Removal

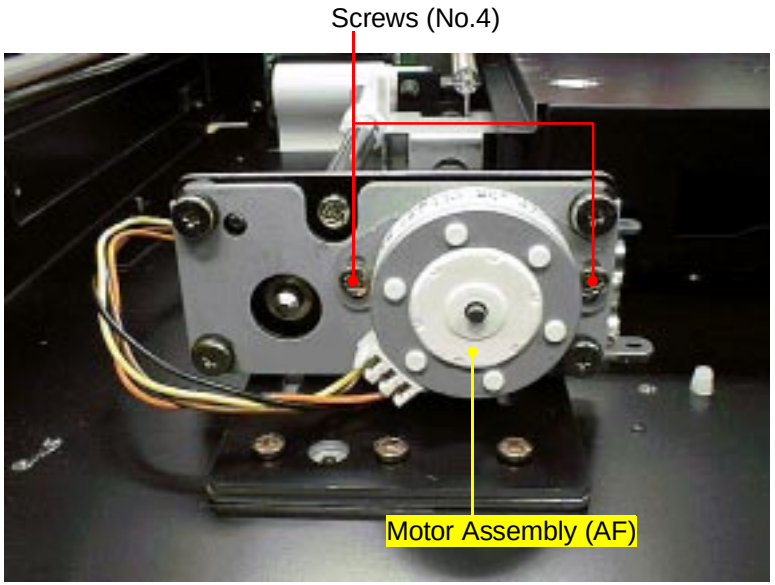


Figure 4-23. AF Motor Assembly Removal

⚠CAUTION

You are required to set the timing belt with a special care while installing the AF motor assembly. Be sure to follow the instruction provided in the next page to set the timing belt peoperly.

4.2.3.9 AF Motor Assembly Installation

Follow the steps below when installing the AF motor assembly to the scanner body.

1. Engaging the timing belt with the pinion gear of the motor, install the motor to the frame with 2 screws (No. 4).
2. Mount the sprint plate, fixing tension plate, and the tension plate assembly, and fix them with 2 screws (No. 6) temporarily. Ensure that the tension plate assembly is upheld by this operation.
3. Turning the screw pulley attached to the screw shaft end manually, loosen the screw fixing the tension plate assembly to tense the belt, then fasten the screw again.

⚠CAUTION ***When fixing the tension plate assembly, be careful not to apply excessive tension, since it may cause the motor to rotate improperly.***

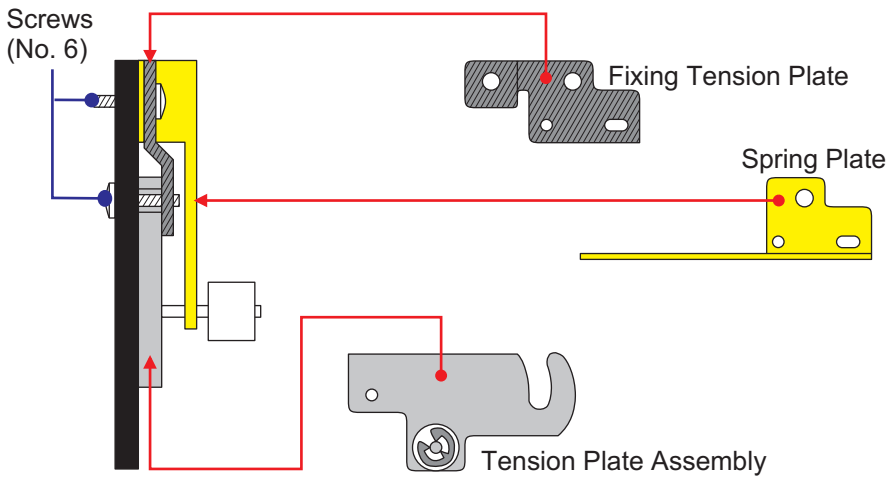


Figure 4-24. Tension Plate Assembly

✓CHECK POINT ***When installing the tension plate assembly, make sure that the location bump is not covered with the plate.***

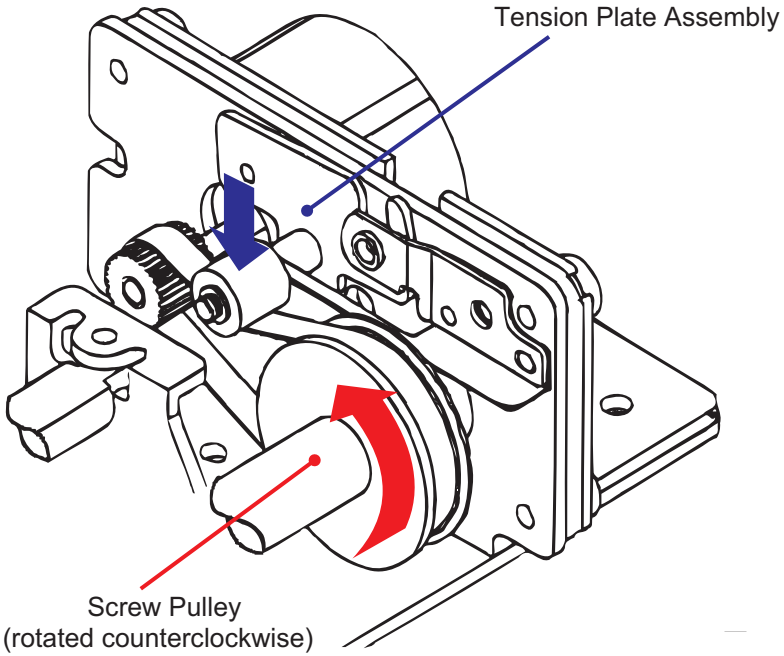


Figure 4-25. Timing Belt Tension

CHAPTER

5

ADJUSTMENT

5.1 OVERVIEW

This scanner requires no adjustment for any service such as disassembling and assembling the scanner including part replacement is provided within the specification in Chapter 4 “Disassemble and Assembly”.

CHAPTER

6

MAINTENANCE

6.1 OVERVIEW

This chapter provides information necessary to keep the scanner function in optimum condition constantly and to prevent troubles.

6.1.1 Cleaning

Perform cleaning when stain is noticeable. Stain on the document glass, particularly, has direct effect on scanned image. Therefore, be sure to clean the glass well to remove stain thoroughly.

⚠CAUTION ***Never apply any organic solvent such as thinner and benzine , since these may deteriorate plastic and rubber parts.***

- ❑ Outer cases
  Wipe stain off with a clean cloth which is moistened with water and then squeezed tightly. To remove severe stain, use neutral detergent.

- ❑ Document glass
  Remove dust and paper debris with a dry clean cloth. If stain is severe or foreign matter is stuck, use a cloth absorbed with neutral detergent. If trace is left, wipe it off well with a dry, clean cloth again.

⚠CAUTION ***If you need to clean the reverse side of the glass, be sure to remove the glass using the specified adjusting tools.***

6.1.2 Lubrication

This scanner needs no lubrication at the level of service specified in the service manual.

CHAPTER

7

APPENDIX

7.1 OVERVIEW

This chapter provides information necessary for servicing.

7.1.1 Connector Pin Assignment

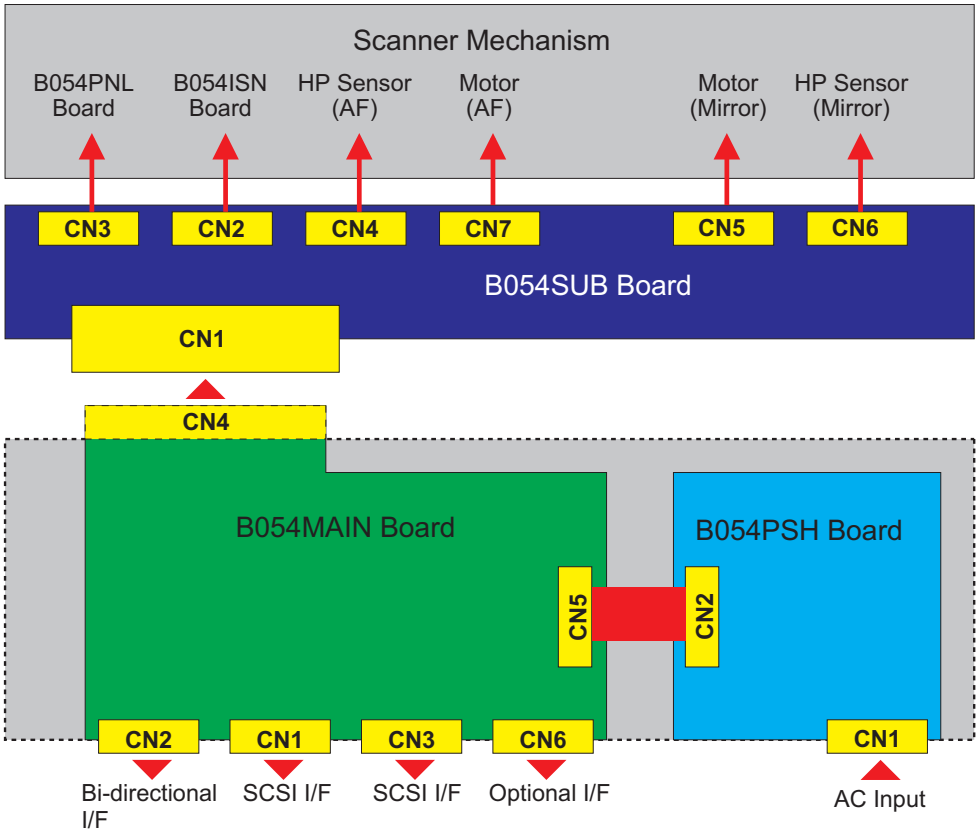


Figure 7-1. Connector Pin Assignment

7.1.2 Connector Summary

Connectors used on the electrical circuit boards are summarized in the table below.

Table 7-1. Connector Summary

Board	CN No.	Function	Ref.
B054MAIN	CN1/3	For connection with SCSI I/F	GT-9500
	CN2	For connection with Bi-directional I/F	GT-9500
	CN4	For connection with B054SUB Board (In a card-edge format)	Page 7-2
	CN5	Power supply line from the B054PSH board	Page 7-3
	CN6	For connection with the option	Page 7-3
B054PSH	CN1	For connection with AC inlet	–
	CN2	⇨Power supply line for B054MAIN board	Page 7-3
B054SUB	CN1	⇨For connection to B054MAIN board	Page 7-2
	CN2	⇨For connection to B054ISN board (CCD sensor, Inverter board)	Page 7-4
	CN3	⇨For connection to B054PNL board	Page 7-4
	CN4	⇨For connection to the HP sensor (for focus)	Page 7-4
	CN5	⇨For connection to the motor (for mirror)	Page 7-4
	CN6	⇨For connection to HP sensor (for mirror)	Page 7-5
	CN7	⇨For connection to the motor (for focus)	Page 7-5

B054MAIN – CN4

No.	Signal Name	Function
A1	GND	GND
A2	GND	GND
A3	ADD2	Address (2)
A4	ADD0	Address (0)
A5	A/D	AD clock
A6	WR	WR signal for ADC
A7	CLP	Clamp signal for ADC
A8	SG	Shutter (Green) for CCD
A9	RSP	Reset signal for CCD
A10	TG	Shift signal for CCD
A11	AD1	Image data (1) after AD conversion
A12	AD3	Image data (3) after AD conversion
A13	AD5	Image data (5) after AD conversion
A14	AD7	Image data (7) after AD conversion
A15	AD9	Image data (9) after AD conversion
A16	AD11	Image data (11) after AD conversion
A17	GND	GND
A18	RESETSW	Reset SW signal
A19	LED(R)	LED (READY) signal
A20	+5	Power supply (+5V)
A21	GND	GND
A22	LAMP	Lamp signal
A23	+24	Power supply (+24V)
A24	GND	GND
A25	HMF(P)	Home sensor (AF) (Power supply)
A26	MFA	Motor (AF) (Phase A)
A27	MFAX	Motor (AF) (Phase /A)
A28	HMM(S)	Home sensor (Mirror) (Signal)
A29	MMB	Motor (Mirror) (Phase B)
A30	MMBX	Motor (Mirror) (Phase /B)
A31	GND	GND

No.	Signal Name	Function
B1	+5V	Power supply (+5V)
B2	+12V	Power supply (+12V)
B3	ADD1	Address (1)
B4	STLN	Start line signal for ADC
B5	CSAP	Chip select ADC
B6	SMP	Sample hold signal for ADC
B7	SB	Shutter (Blue) for CCD
B8	SR	Shutter (Red) for CCD
B9	CK	Clock signal for CCD
B10	AD0	Image data (0) after AD conversion
B11	AD2	Image data (2) after AD conversion
B12	AD4	Image data (4) after AD conversion
B13	AD6	Image data (6) after AD conversion
B14	AD8	Image data (8) after AD conversion
B15	AD10	Image data (10) after AD conversion
B16	GND	GND
B17	POWERSW	Power switch (secondary side)
B18	LED(P)	LED (POWER)
B19	LED(ER)	LED (ERROR)
B20	GND	GND
B21	GND	GND
B22	+24	Power supply (+24V)
B23	+24	Power supply (+24V)
B24	HMF(S)	Home sensor (AF) (Signal)
B25	MFB	Motor (AF) (Phase B)
B26	MFBX	Motor (AF) (Phase /B)
B27	GND	GND
B28	HMM(P)	Home sensor (Mirror) (Power supply)
B29	MMA	Motor (Mirror) (Phase A)
B30	MMAX	Motor (Mirror) (Phase /A)
B31	GND	GND

B054MAIN – CN5

No.	Signal Name	Function
1	+24V	Power supply (for motor drive, lamp)
2	+24V	Power supply (for motor drive, lamp)
3	+24V	Power supply (for motor drive, lamp)
4	GND	GND
5	GND	GND
6	GND	GND
7	+5V	Power supply (for logic line)
8	+5V	Power supply (for logic line)
9	+15V	Power supply (for producing +12V)
10	GND	GND
11	TMP	Output from the thermistor
12	SW	Power switch (Secondary side) control signal

B054MAIN – CN6

No.	Signal Name	Function
1	IN1	TPU (HOME) / Select
2	IN2	TPU (COVER) / Select
3	IN3	Not used.
4	OU5	Lamp control signal
5	IN4	Not used.
6	+5	Power supply (+5V)
7	GND	GND
8	+24	Power supply (+24V)
9	SDAT	Motor drive serial data for TPU
10	SCK	Transfer clock for TPU
11	LOD	Latch pulse for TPU
12	SEL	Select signal for TPU
13	+5	Power supply (+5V)
14	GND	GND
15	+24	Power supply (+24V)
16	+24	Power supply (+24V)
17	GND	GND
18	+5	Power supply (+5V)
19	+5	Power supply (+5V)
20	+24	Power supply (+24V)
21	RXD	RXD signal for ADF
22	/RXD	/RXD signal for ADF
23	/TXD	/TXD signal for ADF
24	TXD	TXD signal for ADF
25	DSR	DSR signal for ADF
26	DTR	DTR signal for ADF

B054SUB – CN2

No.	Signal Name	Function
1	+12	Power supply (+12V)
2	GND	GND
3	+5	Power supply (+5V)
4	GND	GND
5	+5	Power supply (+5V)
6	GND	GND
7	+12V	Power supply (+12V)
8	S2	Address (2)
9	S1	Address (1)
10	S0	Address (0)
11	STL	Start line for ADC
12	A/D	AD clock
13	CS	Chip select signal
14	WR	WR signal for ADC
15	SMP	Sample hold signal for ADC
16	CLP	Clamp signal for ADC
17	SB	Shutter signal (Blue) for CCD
18	SG	Shutter signal (Green) for CCD
19	SR	Shutter signal (Red) for CCD
20	RSP	Reset signal for CCD
21	CK	Clock signal for CCD
22	TG	Shift signal for CCD
23	AD0	Image data (0) after AD conversion
24	AD1	Image data (1) after AD conversion
25	AD2	Image data (2) after AD conversion
26	AD3	Image data (3) after AD conversion
27	AD4	Image data (4) after AD conversion
28	AD5	Image data (5) after AD conversion
29	AD6	Image data (6) after AD conversion
30	AD7	Image data (7) after AD conversion
31	AD8	Image data (8) after AD conversion
32	AD9	Image data (9) after AD conversion
33	AD10	Image data (10) after AD conversion
34	AD11	Image data (11) after AD conversion
35	GND	GND

B054SUB – CN3

No.	Signal Name	Function
1	+24	Power supply (+24V)
2	+24	Power supply (+24V)
3	+24	Power supply (+24V)
4	+24	Power supply (+24V)
5	LAMP	Lamp signal
6	GND	GND
7	GND	GND
8	GND	GND
9	GND	GND
10	+5V	Power supply (+5V)
11	LED (ERR)	LED (ERROR)
12	LED (RES)	LED (READY)
13	LED (POW)	LED (POWER)
14	RESETSW	RESET switch signal
15	POWERSW	POWER switch signal
16	GND	GND

B054SUB – CN4

No.	Signal Name	Function
1	HMF(S)	Home sensor (AF) (Signal)
2	GND	GND
3	HMF(P)	Home sensor (AF) (Power supply)

B054SUB – CN5

No.	Signal Name	Function
1	MFB	Motor (AF) (Phase B drive signal)
2	MFA	Motor (AF) (Phase A drive signal)
3	MFBX	Motor (AF) (Phase /B drive signal)
4	MFAX	Motor (AF) (Phase /A drive signal)

B054SUB – CN6

No.	Signal Name	Function
1	HMM(S)	Home sensor (Mirror) (Signal)
2	GND	GND
3	HMM(P)	Home sensor (Mirror) (Power supply)

B054SUB – CN7

No.	Signal Name	Function
1	MMB	Motor (Mirror) (Phase B drive signal)
2	MMA	Motor (Mirror) (Phase A drive signal)
3	MMBX	Motor (Mirror) (Phase /B drive signal)
4	MMAX	Motor (Mirror) (Phase /A drive signal)

7.2 COMPONENT LAYOUT

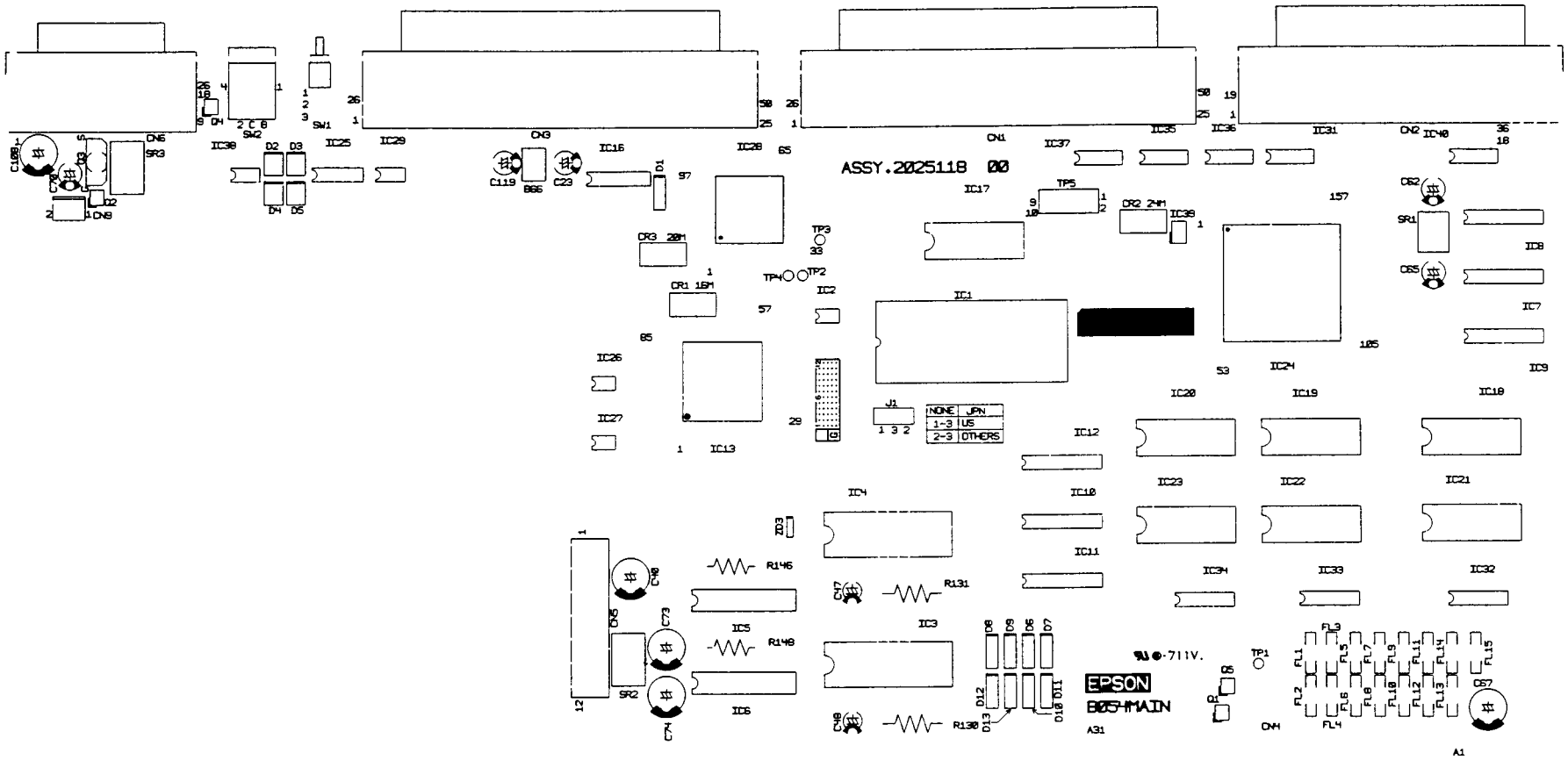


Figure 7-2. Component Layout - B054MAIN Board

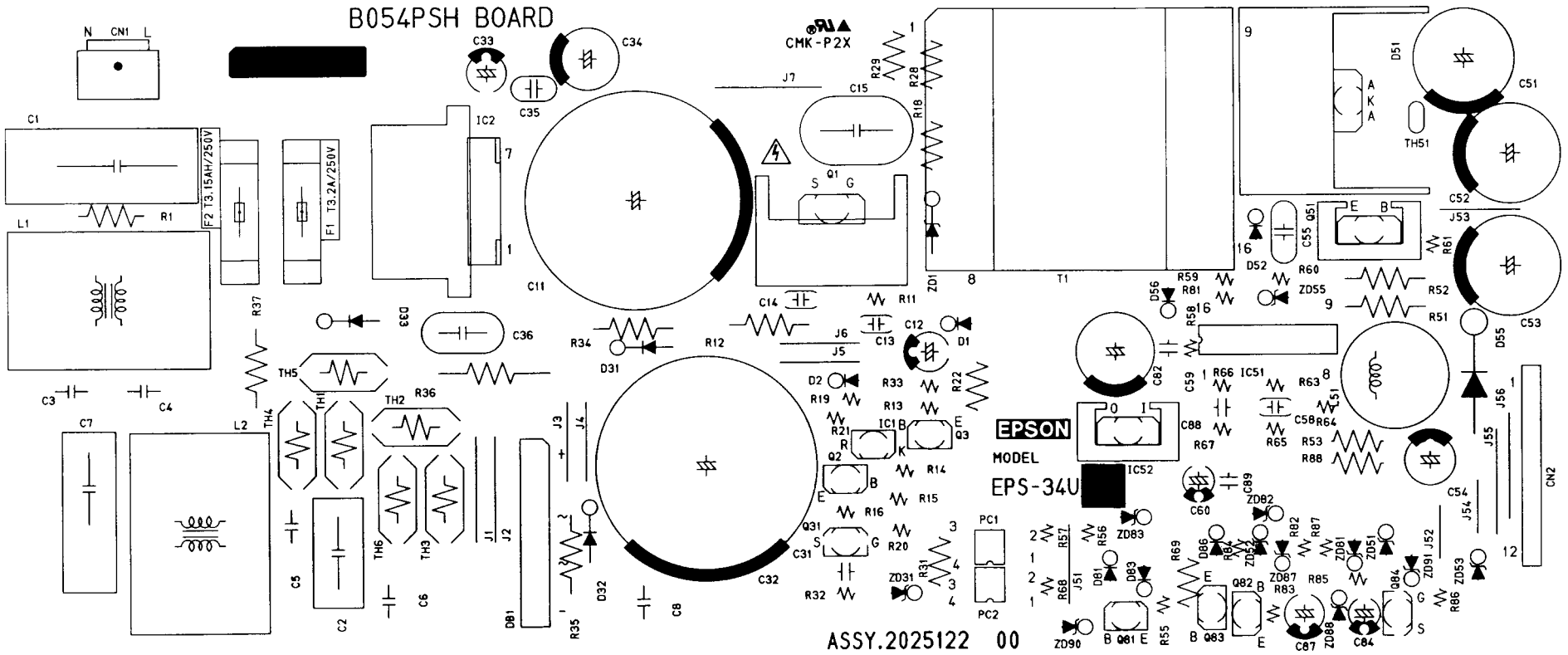


Figure 7-3. Component Layout - B054PSH Board

7.3 CIRCUIT DIAGRAMS

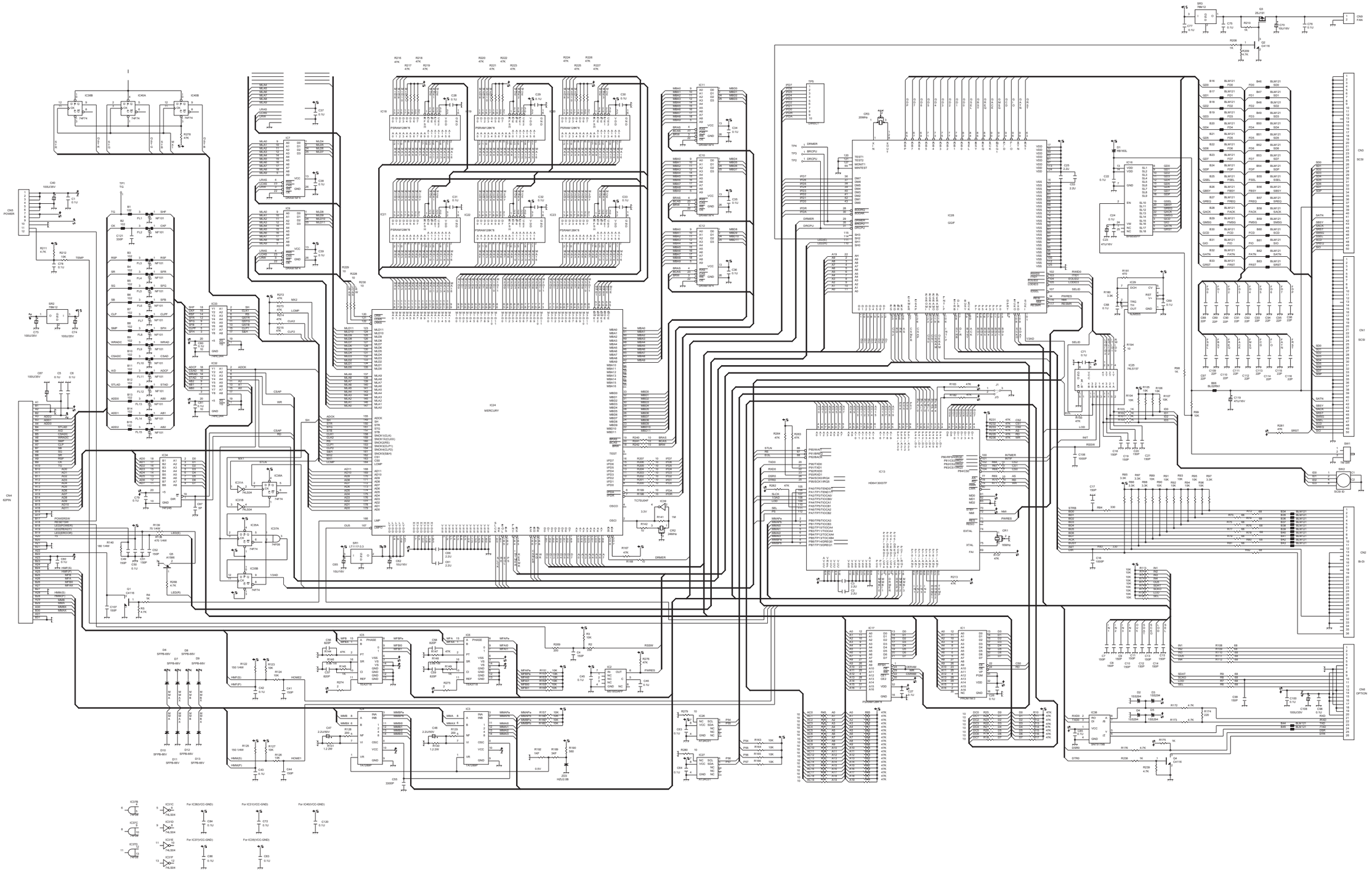


Figure 7-4. B054MAIN Board Circuit Diagram

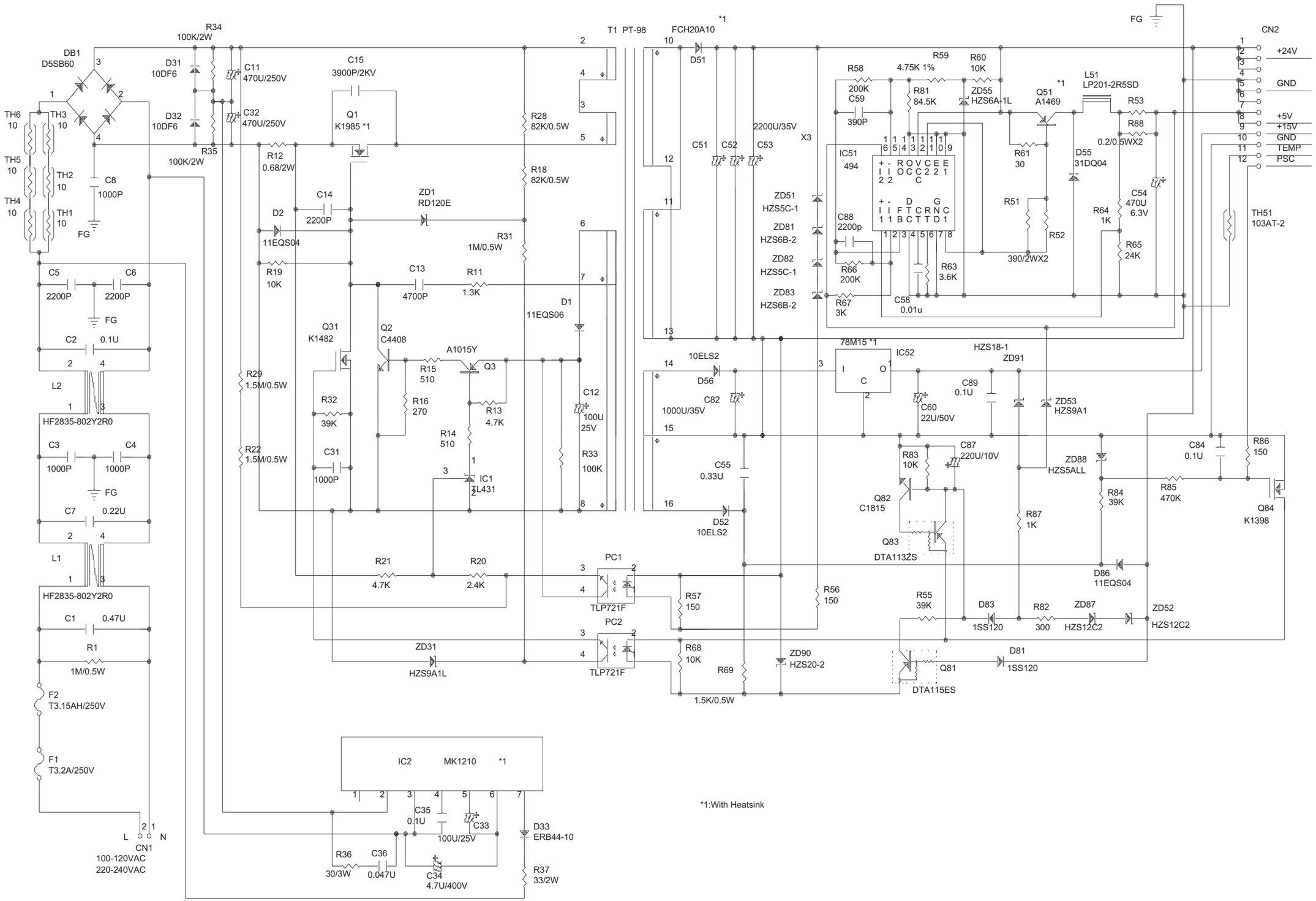
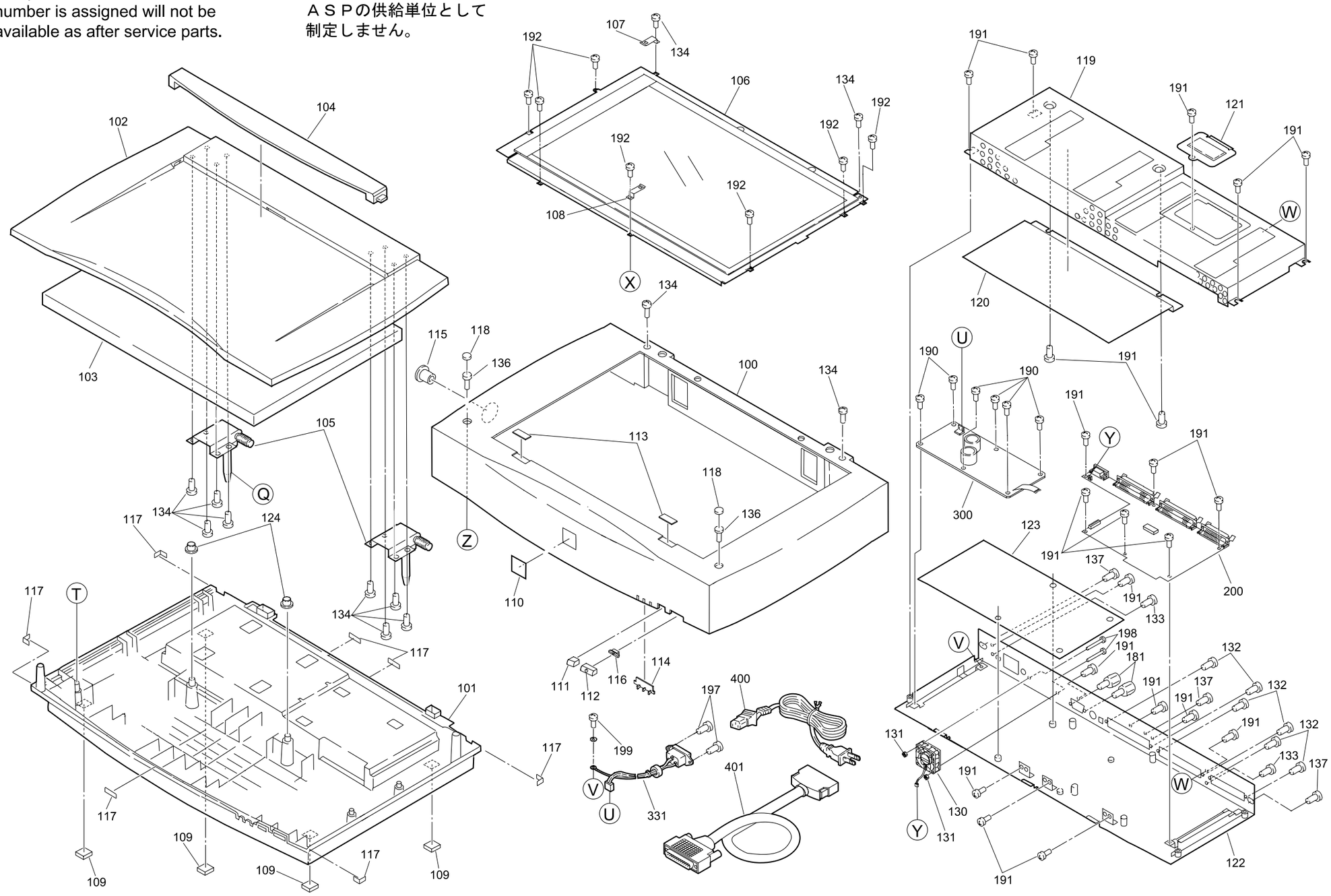


Figure 7-5. B054PSH Board Circuit Diagram

7.4 EXPLODED DIAGRAMS

The parts to which no reference number is assigned will not be available as after service parts.

図番の無い部品については、
ＡＳＰの供給単位として
制定しません。



EXPLODED DIAGRAM FOR ES-8000 / GT-12000 / Expression 836 (1)

Figure 7-6. Exploded Diagrams (1)

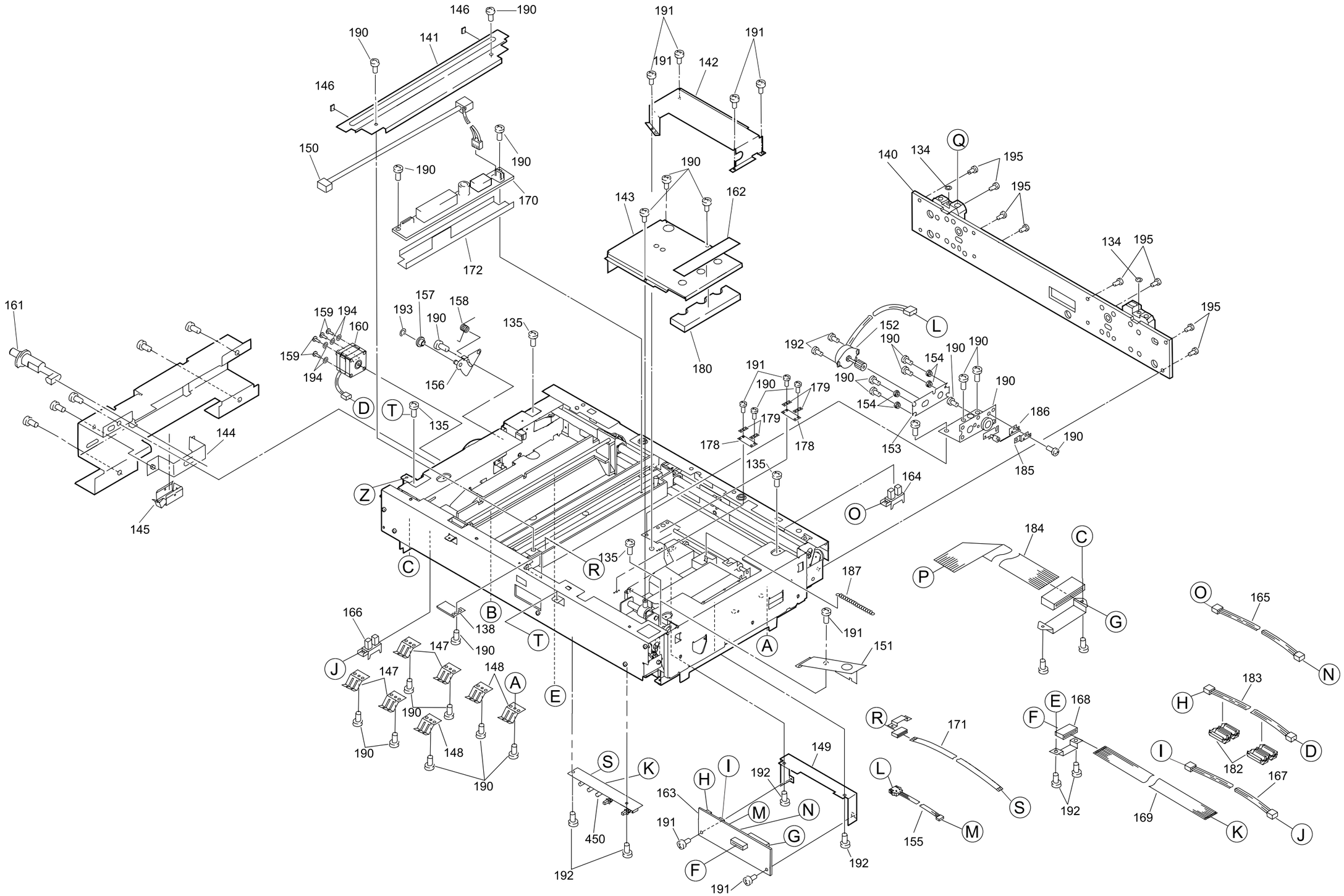


Figure 7-7. Exploded Diagrams (2)

SERVICE MANUAL

ADF (Auto Document Feeder)

EPSON

4008512

NOTICE

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PRECAUTIONS

Precautionary notations throughout the text are categorized relative to 1)Personal injury and 2) damage to equipment.

DANGER Signals a precaution which, if ignored, could result in serious or fatal personal injury. Great caution should be exercised in performing procedures preceded by DANGER Headings.

WARNING Signals a precaution which, if ignored, could result in damage to equipment.

The precautionary measures itemized below should always be observed when performing repair/maintenance procedures.

DANGER

1. ALWAYS DISCONNECT THE PRODUCT FROM THE POWER SOURCE AND PERIPHERAL DEVICES PERFORMING ANY MAINTENANCE OR REPAIR PROCEDURES.
2. NOWORK SHOULD BE PERFORMED ON THE UNIT BY PERSONS UNFAMILIER WITH BASIC SAFETY MEASURES AS DICTATED FOR ALL ELECTRONICS TECHNICIANS IN THEIR LINE OF WORK.
3. WHEN PERFORMING TESTING AS DICTATED WITHIN THIS MANUAL, DO NOT CONNECT THE UNIT TO A POWER SOURCE UNTIL INSTRUCTED TO DO SO. WHEN THE POWER SUPPLY CABLE MUST BE CONNECTED, USE EXTREME CAUTION IN WORKING ON POWER SUPPLY AND OTHER ELECTRONIC COMPONENTS.

WARNING

1. REPAIRS ON EPSON PRODUCT SHOULD BE PERFORMED ONLY BY AN EPSON CERTIFIED REPAIR TECHNICIAN.
2. MAKE CERTAIN THAT THE SOURCE VOLTAGES IS THE SAME AS THE RATED VOLTAGE, LISTED ON THE SERIAL NUMBER/RATING PLATE. IF THE EPSON PRODUCT HAS A PRIMARY AC RATING DIFFERENT FROM AVAILABLE POWER SOURCE, DO NOT CONNECT IT TO THE POWER SOURCE.
3. ALWAYS VERIFY THAT THE EPSON PRODUCT HAS BEEN DISCONNECTED FROM THE POWER SOURCE BEFORE REMOVING OR REPLACING PRINTED CIRCUIT BOARDS AND/OR INDIVIDUAL CHIPS.
4. IN ORDER TO PROTECT SENSITIVE MICROPROCESSORS AND CIRCUITRY, USE STATIC DISCHARGE EQUIPMENT, SUCH AS ANTI-STATIC WRIST STRAPS, WHEN ACCESSING INTERNAL COMPONENTS.
5. REPLACE MALFUNCTIONING COMPONENTS ONLY WITH THOSE COMPONENTS BY THE MANUFACTURE; INTRODUCTION OF SECOND-SOURCE ICs OR OTHER NONAPPROVED COMPONENTS MAY DAMAGE THE PRODUCT AND VOID ANY APPLICABLE EPSON WARRANTY.

PREFACE

This manual describes basic functions, theory of electrical and mechanical operations, maintenance and repair procedures of ADF. The instructions and procedures included herein are intended for the experienced repair technicians, and attention should be given to the precautions on the preceding page. The chapters are organized as follows:

CHAPTER 1. PRODUCT DESCRIPTIONS

Provides a general overview and specifications of the product.

CHAPTER 2. OPERATING PRINCIPLES

Describes the theory of electrical and mechanical operations of the product.

CHAPTER 3. TROUBLESHOOTING

Provides the step-by-step procedures for troubleshooting.

CHAPTER 4. DISASSEMBLY AND ASSEMBLY

Describes the step-by-step procedures for disassembling and assembling the product.

CHAPTER 5. ADJUSTMENTS

Provides Epson-approved methods for adjustment.

CHAPTER 6. MAINTENANCE

Provides preventive maintenance procedures and the lists of Epson-approved lubricants and adhesives required for servicing the product.

APPENDIX

Provides the following additional information for reference:

- *Connector pin assignments*
- *Electric circuit boards components layout*
- *Exploded diagram*
- *Electrical circuit boards schematics*

REVISION STATUS

Rev.	Date	Page(s)	Contents
A	1997/10/20	All	First release

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OPERATING PRINCIPLES

TROUBLESHOOTING

DISASSEMBLY AND ASSEMBLY

ADJUSTMENT

MAINTENANCE

APPENDIX

CHAPTER

1

PRODUCT DESCRIPTIONS

1.1 FEATURES

This auto document feeder (ADF) is the exclusive ADF for GT-12000, and its main features are as follows:

- ❑ Supports large document up to A3 size
- ❑ Page transportation system
  Document is transported page by page for each scanning operation
- ❑ Supports duplex feeding function
  - Document is automatically reversed for scanning.

1.2 PRODUCT DESCRIPTION

BASIC SPECIFICATION

Type:	Page transportation & duplex scanning type
Document transportation:	- Document center aligning - Fed faced-up from the bottom - Face-up ejection
Document replacement time:	1.2 seconds (A4/LT landscape)
Loading plural sizes:	Unavailable (Size of the document in a stack must be the same.)
Noise:	50dB or less

Accuracy in top position:	Single feed:	0 – +2 mm
	Duplex feed:	0 – +2 mm
Center alignment:	Single feed:	+1.5 mm
	Duplex feed:	+3 mm
Document skew:	Single feed:	+1.5 mm
	Duplex feed:	+3 mm

* Center alignment = (C+D)/2
* Skew amount = (A-B)x200/L

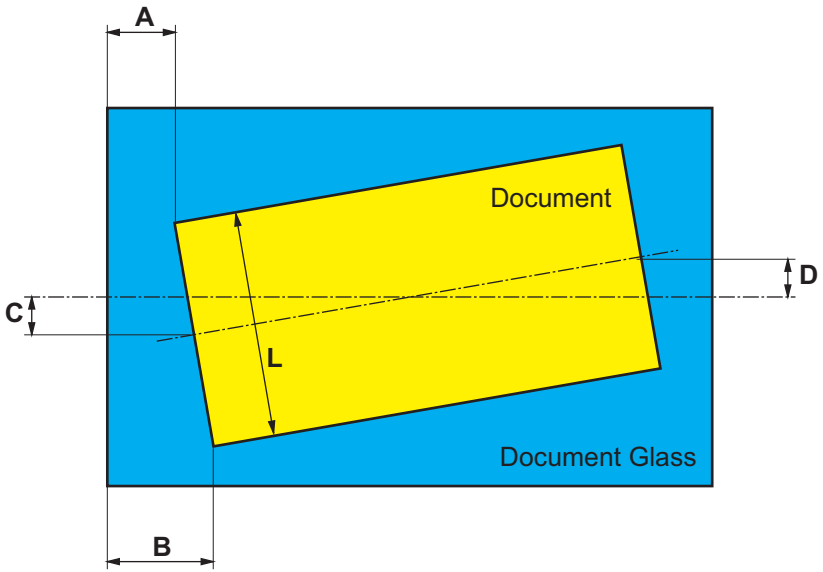


Figure 1-1. Paper Feed Accuracy

DOCUMENT SUPPORTED

Document size:	[Portrait] A3, LD, B4, LG, A4, LT, B5, A5, 140X148 mm / 5.5 x 5.8 inch [Landscape] A4, LT, B5, A5
Feeding capacity:	50 sheets (80 g/m^2) - A4 landscape/portrait - LT landscape/portrait or smaller 30 sheets (80 g/m^2) - B4, LG or larger
Ejecting capacity:	100 sheets
Applicable document	[Paper Type] - High quality paper - Average quality paper - Ink-jet paper (fine/super fine equivalent) - Bond paper [Paper thickness] 50 - 127 g/m^2 Document whose thickness is more than 110g/m^2 is applicable in the normal condition* only. (Normal condition : 15 - 25° C, 40 - 70%).
Inapplicable document:	- Tracing paper, Coating paper, Pasted paper, Label paper, OHP film, Carbon paper, Catalogue paper, Special paper including rice paper - Stapled paper, Clipped paper - Paper with many holes (ex, loose-leaf paper) - Paper with rip, curl and bent

ELECTRICAL SPECIFICATION

Power supply:	Supplied through the scanner - DC24V ± 10% - DC5V ± 10%
Consumption current:	DC24V = 2.0A DC5V = 0.3A
Insulation resistance:	10 mΩ or more at DC500V (Between AC line and chassis)
Dielectric strength:	AC1000V per minute (Between AC line and chassis)
Resistance to static electric noise:	Case = Operated properly at 10KV or less Metal = Operated properly at 7KV or less

ENVIRONMENTAL CONDITION

Temperature:	- Operation = 5 - 35°C - Storage = -25 - 60°C
Humidity:	- Operation = 10 - 80% * - Storage = 10 - 85% * * *Without condensation*
Resistance to vibration:	- Operation = 0.2G / 5 - 55Hz in X,Y,Z directions - Storage = 2G / 5 - 55Hz in X,Y,Z directions
Dropping test:	Height = 62 cm / 24.2 inch* ** When packed.*

RELIABILITY

Paper feeding life:	100,000 sheets
Paper ejecting life:	100,000 sheets
Hinge:	100,00 close motions or more

SAFETY, EMC

Safety regulations:	- UL1950 - CSA950 - FCC
CE Marking:	- Directive 89/336EEC, 92/31 EEC - Directive 73/23 EEC

OPERATING CONDITION

Environment:	Ordinal office or home conditions. (Place with extreme dust should be avoided.)

APPEARANCE

Weight:	16Kg or less
Dimensions (W x D x H):	601 x 529 x 122 mm / 23.6 x 20.8 x 4.8 inch (with the extension tray stored.)

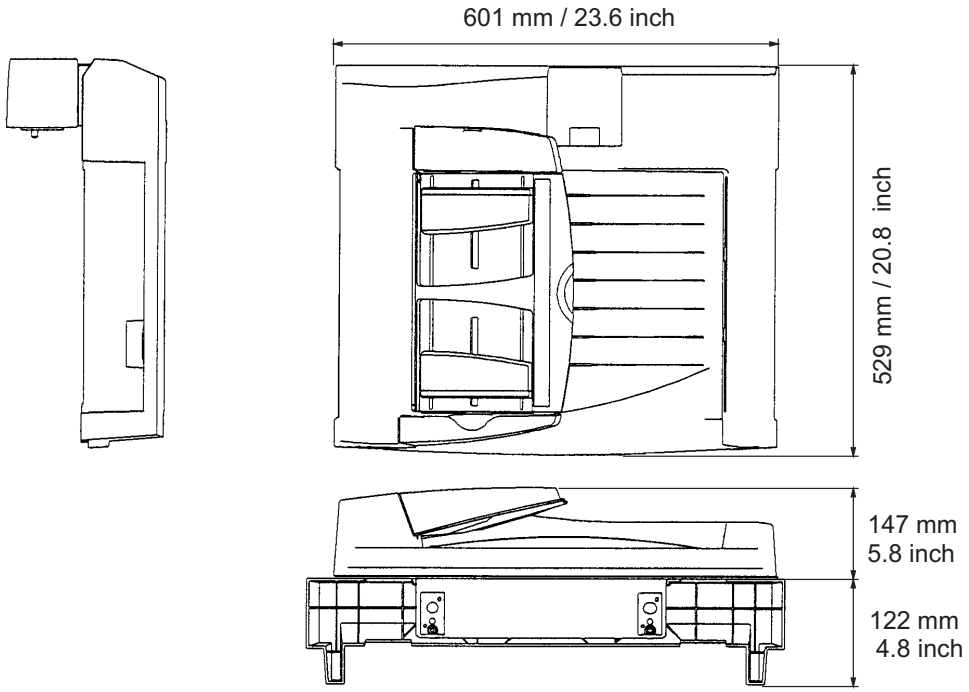


Figure 1-2. External Dimensions of the ADF

CHAPTER

2

OPERATING PRINCIPLES

2.1 OVERVIEW

This chapter gives information on operating principles of the ADF which can be used with the EPSON scanner GT-12000. The contents of this chapter are as follows:

Section 2.1.1: ADF mechanism
- ❑ Single feeding
- ❑ Reverse feeding

Section 2.1.2: Electrical Circuit
- ❑ Sensor circuits
- ❑ Reset circuits
- ❑ Driver circuits
- ❑ Rush current limitation circuit
- ❑ EEPROM write circuit

2.1.1 ADF Mechanism

See Figure 2-1 which shows major mechanism parts of the ADF and their locations. In both Single/Reverse feeding modes, document is picked up at the paper feed tray and is then transported in the ADF and ejected to the output tray. This process is described step by step thorough out the section.
Descriptions for single and reverse feedings are given separately. As you follows the steps, make sure that you refer to Figure 2-1 for exact locations of the parts and their functions.

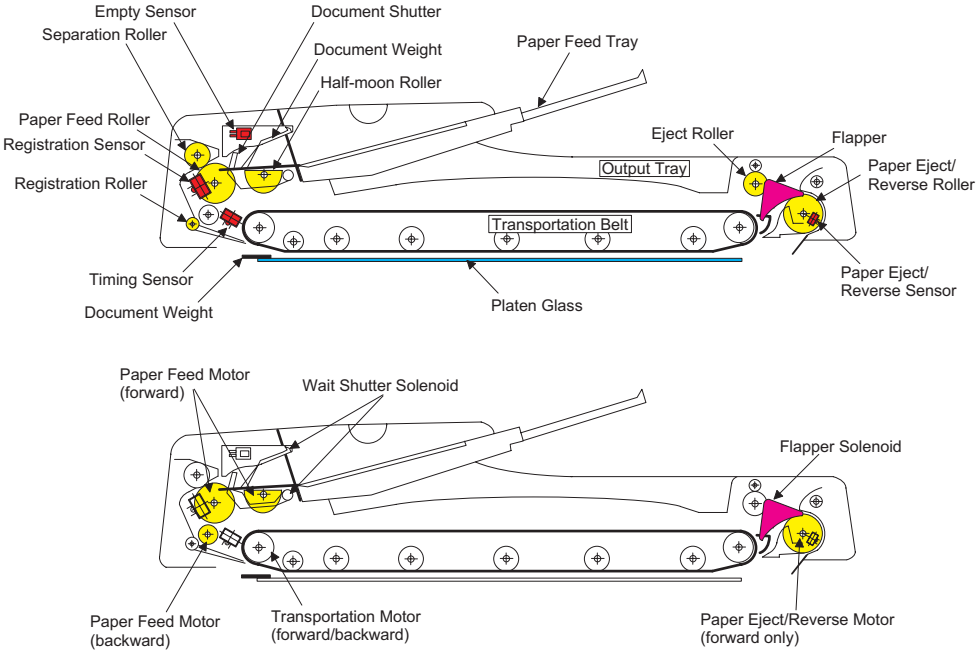


Figure 2-1. Major Mechanism Parts and Their Locations

SINGLE FEEDING

In single feeding mode, the ADF loads document from the paper feed tray and transports it to the scanning position, then ejects it immediately after scanning. Therefore, document must be always transported in single direction to let the ADF repeat feeding/ejecting operation cycle.

Setting document

1. Document is set in the paper feed tray.

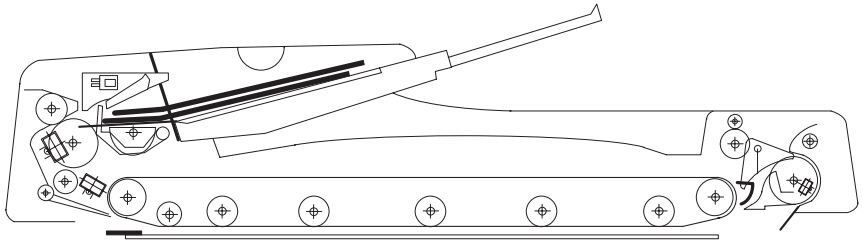


Figure 2-2. Document Set Condition (Step 1)

Pre-feeding

"Pre-feeding" means the sequence in which the ADF transports document from the paper feed tray to the scanning position according to the single feed command sent from the scanner.

2. When the wait shutter solenoid turns on, the document is picked up and transported from the paper feed tray by the forward rotation of the paper feed motor. The motor then stops rotating when the registration sensor comes on. This sequence, from picking up the document to the registration sensor's coming on, is called registration operation. The transportation motor and the paper eject/reverse motor also rotate forward to perform dummy ejection to prevent a remaining document from jamming when the ADF is feeding another document. This is performed for every feeding motion no matter a document is remaining in the ADF or not.

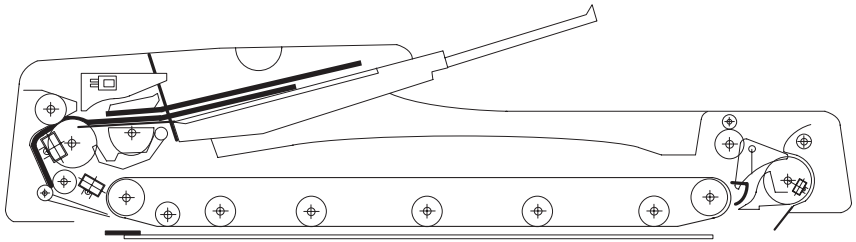


Figure 2-3. Pre-feeding (Step 2)

3. After the registration operation is carried out, the paper feed motor starts rotating forward to transport the document. The document is transported to the position where the timing sensor comes on, which means the end of the pre-feeding operation. Ongoing dummy ejection is carried out.

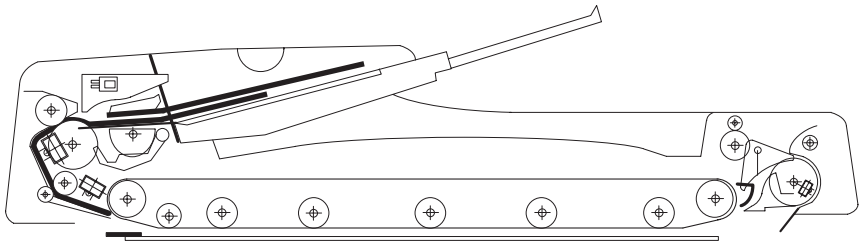


Figure 2-4. Pre-feeding (Step 3)

4. The transportation motor and paper feeding motor rotate forward and backward, respectively, to transport the document onto the platen glass. Then the document size is measured when the registration sensor goes off and the paper feed motor stops rotating when the timing sensor goes off.

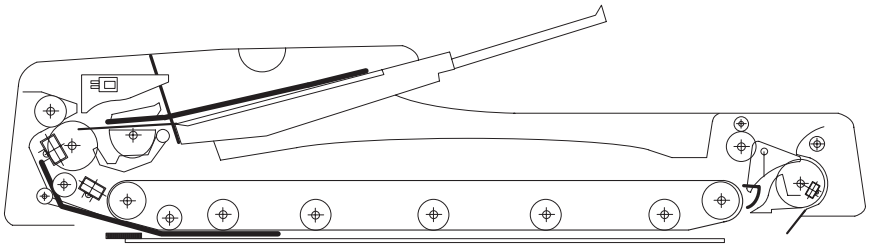


Figure 2-5. Single Feeding (Step 4)

5. The document is transported until the rear edge passed the document stopper, then the transportation motor stops rotating.

6. The transportation motor rotates backward to move the document back until it bumps against the paper stopper, and the motor stops. With the document aligned with the stopper, paper skew is corrected and the document is ready to be scanned. The ADF sends the paper feeding complete signal to the scanner.

7. While scanning is proceeding, the paper feed motor starts rotating forward to pick up and transport the document. The motor stops when the registration sensor comes on.

8. After the registration operation is carried out, the paper feed motor rotates forward to transport the document to the position where the timing sensor comes on, and the pre-feeding operation is done. Then the ADF sends the operation complete signal to the scanner.

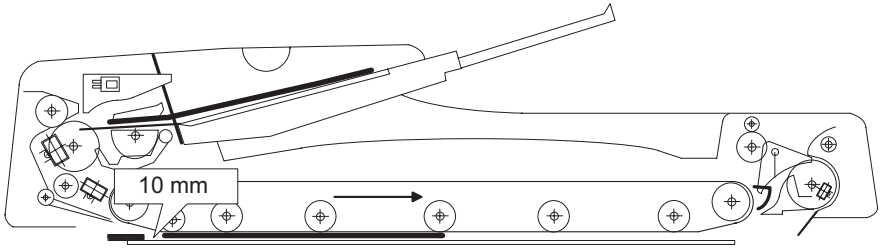


Figure 2-6. Single Feeding (Step 5)

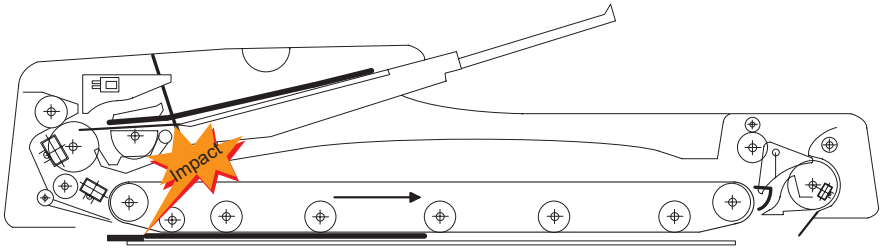


Figure 2-7. Single Feeding (Step 6)

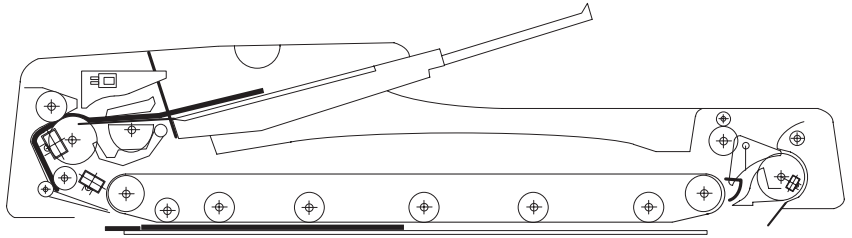


Figure 2-8. Single Feeding (Step 7)

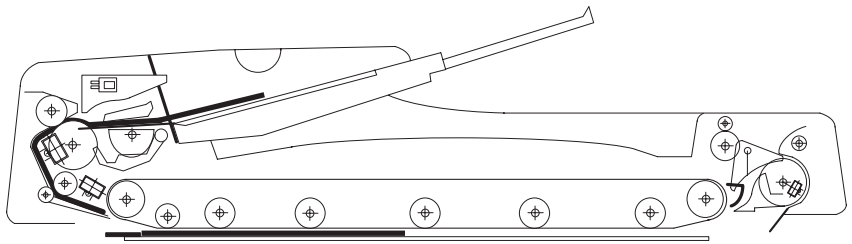


Figure 2-9. Single Feeding (Step 8)

9. After scanned, the scanned document is ejected according to the single feed command from the scanner and the pre-fed document is transported to the scanning position.

10. After the document is fed by the forward rotation of the transportation motor and the paper eject/reverse motor, the paper feed motor rotates backward to transport the document onto the platen glass and stops when the timing sensor goes off.

11. After the paper feed motor stops rotating, the transportation motor transports the document and stops rotating when the rear edge of the document passed the document stopper. In case the empty sensor goes off while the document is transported, the shutter solenoid goes off. The ADF continues to eject the scanned document.

12. Transportation motor rotates backward to feed back the fed document to align it with the document stopper causing impact, then the transportation motor stops. With the document set on the scanning position, the ADF sends the paper feeding complete signal to let the scanner start scanning. The ADF continues to eject the scanned document.

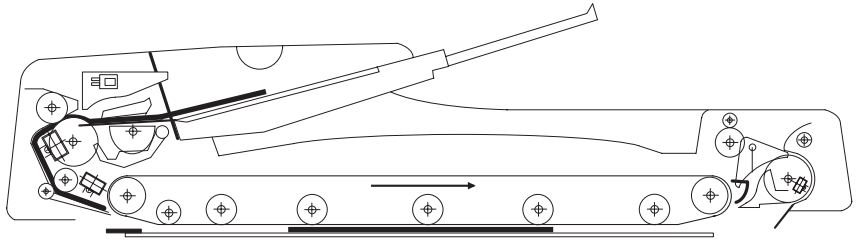


Figure 2-10. Single Feeding (Step 9)

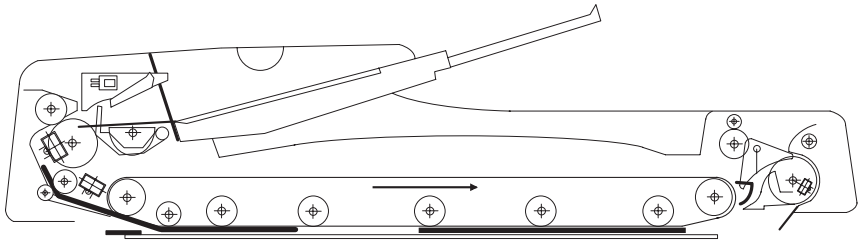


Figure 2-11. Single Feeding (Step 10)

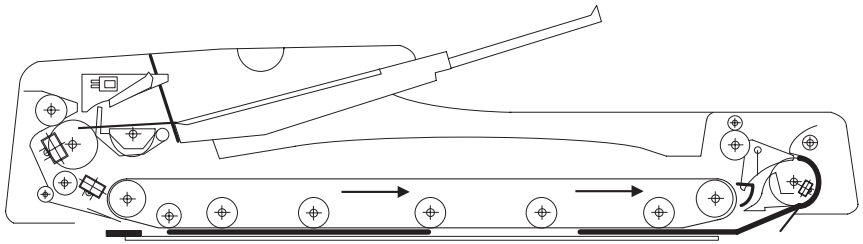


Figure 2-12. Single Feeding (Step 11)

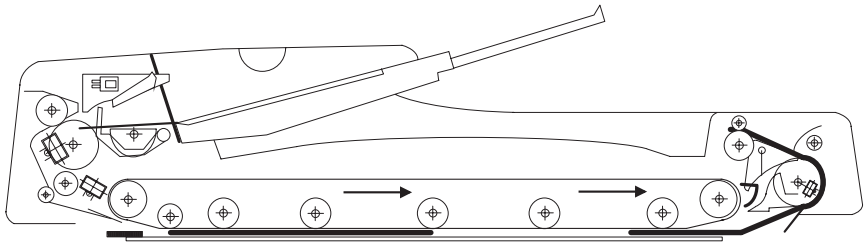


Figure 2-13. Single Feeding (Step 12)

13. While scanning, the document is ejected to the output tray. Rotational speed of the paper eject/reverse motor is reduced when the paper eject/reverse sensor is near off condition to output the document to the output tray slowly.

14. The paper eject/reverse motor stops after outputting the document to the tray slowly. The ADF sends the operation complete signal to the scanner and waits for the next command to be sent.

15. When the ADF receives the ejection command, it starts ejecting the scanned document. The transportation motor and the paper eject/reverse motor rotate forward for this operation.

16. The paper eject/reverse motor reduces its rotational speed when the paper eject/reverse sensor is near off condition to output the document to the output tray slowly. The paper eject/reverse motor then stops when the paper eject/reverse sensor goes off.

17. The ADF sends the operation complete signal to the scanner when the document is slowly ejected and the paper eject/reverse motor stops rotating.

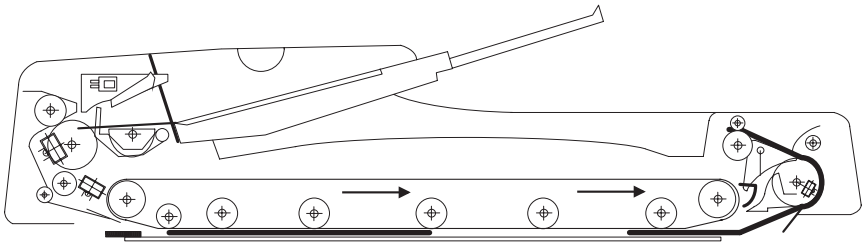


Figure 2-14. Single Feeding (Step 13)

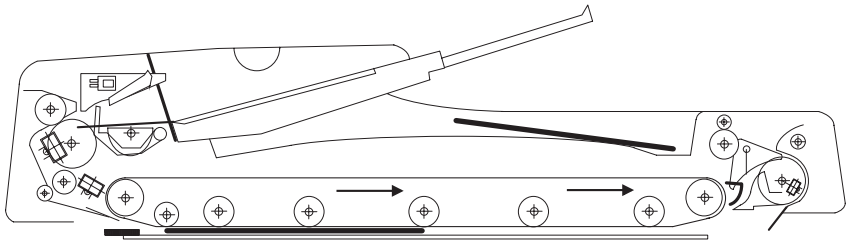


Figure 2-15. Single Feeding (Step 14)

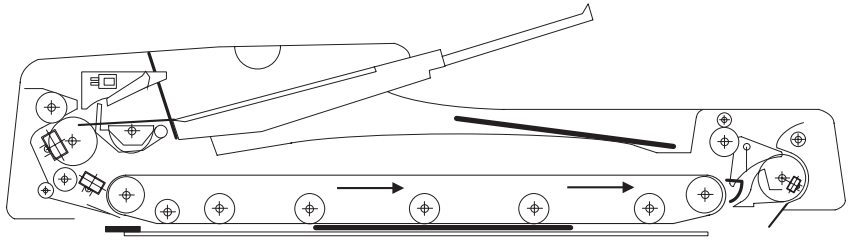


Figure 2-16. Single Feeding (Step 15)

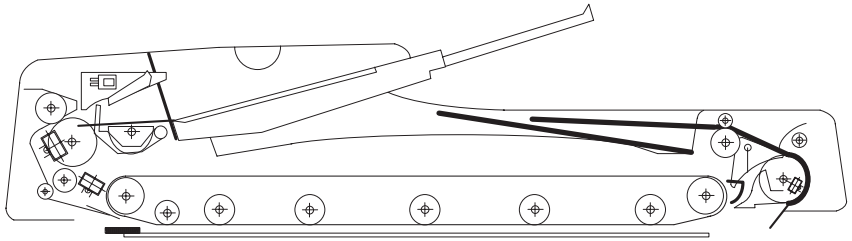


Figure 2-17. Single Feeding (Step 16)

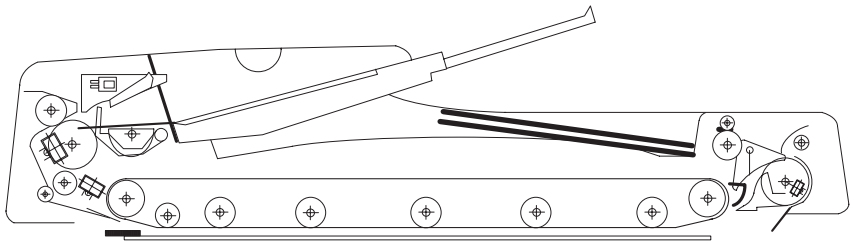


Figure 2-18. Single Feeding (Step 17)

REVERSE FEEDING

In the reverse feeding mode, document is fed in the following order:

The document is fed. → The document is reversed. →
Image is scanned → The document is reversed again. →
Image on the reversed side is scanned.

Setting a document

1. Document is set in the paper feeding tray.

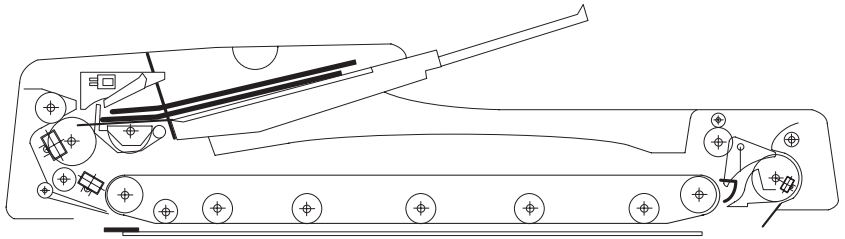


Figure 2-19. Setting a Document (Step 1)

Pre-feeding

"Pre-feeding" consists of operations which pick up the document from the paper feed tray and transport it to the scanning position according to the reverse feed command sent from the scanner.

2. Step 2) After the wait shutter solenoid turns on, the document is picked up and transported from the paper feed tray by the forward rotation of the paper feed motor. The motor then stops rotating when the registration sensor comes on. This sequence, from picking up the document to the registration sensor's coming on, is called registration operation. The transportation motor and the paper eject/reverse motor also rotate forward to perform dummy ejection to prevent a remaining document from jamming when the ADF is feeding another document. This is performed for every feeding motion no matter a document is remaining in the ADF or not.

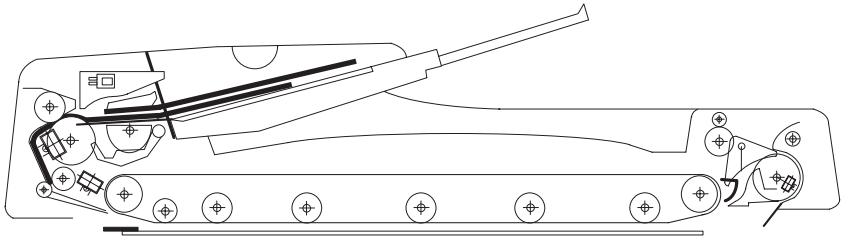


Figure 2-20. Pre-feeding (Step 2)

3. After the registration operation is carried out, the paper feed motor starts rotating forward to transport the document. The document is transported to the position where the timing sensor comes on, which means the end of the pre-feeding operation. Ongoing dummy ejection carries on.

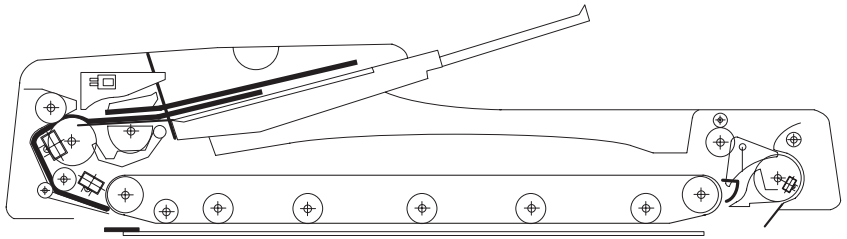


Figure 2-21. Pre-feeding (Step 3)

4. The transportation motor and paper feed motor rotate forward and backward, respectively, to transport the document onto the platen glass. The paper feed motor stops rotating when the registration sensor goes off. The flapper solenoid comes on to switch the paper path to the paper eject/reverse mechanism side.

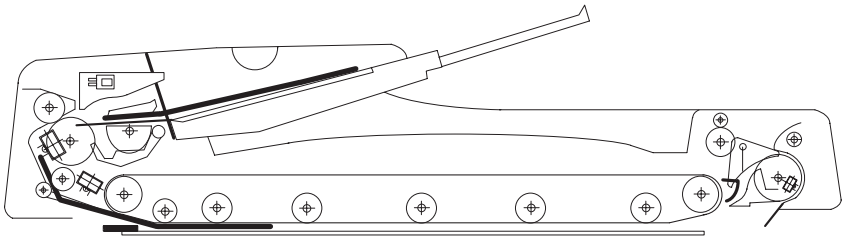


Figure 2-22. Reverse Feeding (Step 4)

5. When the paper eject/reverse sensor comes on, the transportation motor stops and then the paper eject/reverse motor stops to hold the document in the paper eject/reverse mechanism.

6. The transportation motor rotates backward and then the paper eject/reverse motor rotates forward to transport the document from the paper eject/reverse mechanism to the scanning position on the platen glass. The paper eject/reverse motor stops when the paper eject/reverse sensor goes off. When the document bumps against the paper stopper, transportation motor stops and the flapper solenoid goes off to stop transporting the document. With the document set for scanning, the ADF sends the paper feeding complete signal to the scanner, and the scanner starts scanning.

7. The paper feed motor starts rotating forward to pick up and transport another document from the paper feed tray. The motor stops when the registration sensor comes on.

8. After the registration operation is carried out, the paper feed motor rotates forward to transport the pre-fed document to the position where the timing sensor comes on. The pre-feeding operation is complete when the ADF sends the operation complete signal to the scanner.

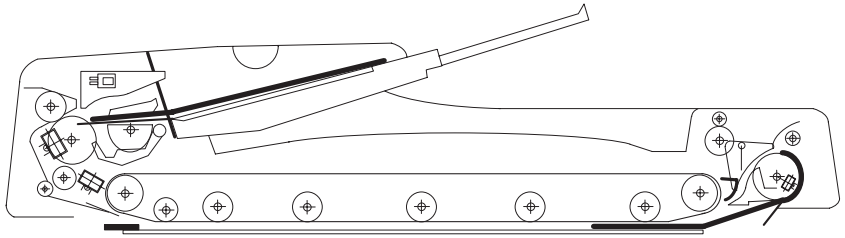


Figure 2-23. Reverse Feeding (Step 5)

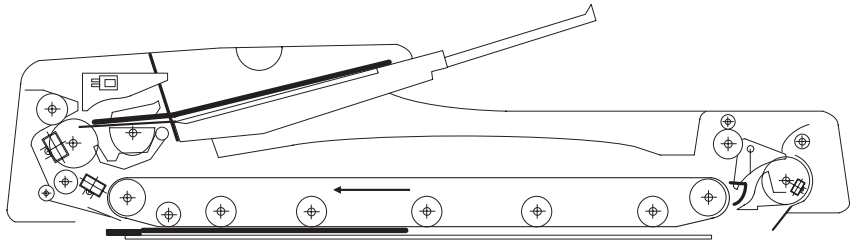


Figure 2-24. Reverse Feeding (Step 6)

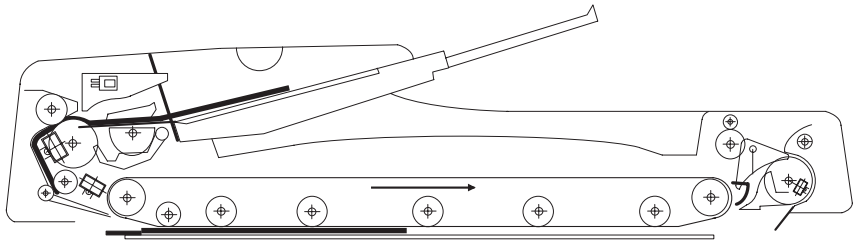


Figure 2-25. Reverse Feeding (Step 7)

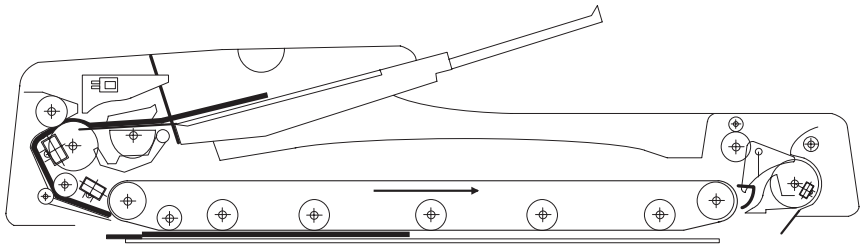


Figure 2-26. Reverse Feeding (Step 8)

9. According to the reverse feeding command, the transportation motor and the paper eject/reverse motor rotate forward to transport the scanned document to the paper eject/reverse mechanism and the flapper solenoid comes on to switch the paper path to the paper eject/reverse mechanism side.

10. When the paper eject/reverse sensor comes on, the transportation motor stops and then the paper eject/reverse motor stops to hold the document in the paper eject/reverse mechanism.

11. The transportation motor rotates backward and then the paper eject/reverse motor rotates forward to transport the document from the paper eject/reverse mechanism to the scanning position on the platen glass. The paper eject/reverse motor stops when the paper eject/reverse sensor goes off. When the document bumps against the paper stopper, transportation motor stops and the flapper solenoid goes off to stop transporting the document. With the document set for scan, the ADF sends the paper feeding complete signal to the scanner, and the scanner starts scanning.

12. After scanning, the ADF starts ejecting the scanned document and transporting the pre-fed document according to the reverse feeding command. The transportation motor and the paper eject/reverse motor rotate forward to transport the document to eject it.

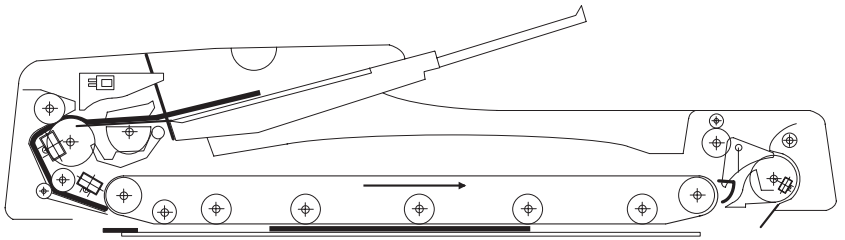


Figure 2-27. Reverse Feeding (Step 9)

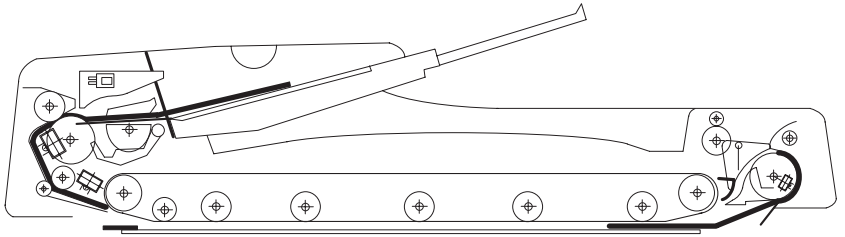


Figure 2-28. Reverse Feeding (Step 10)

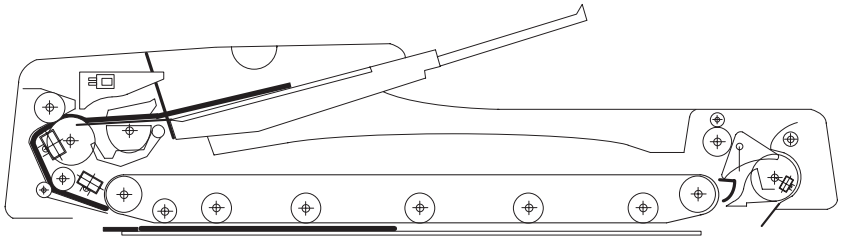


Figure 2-29. Reverse Feeding (Step 11)

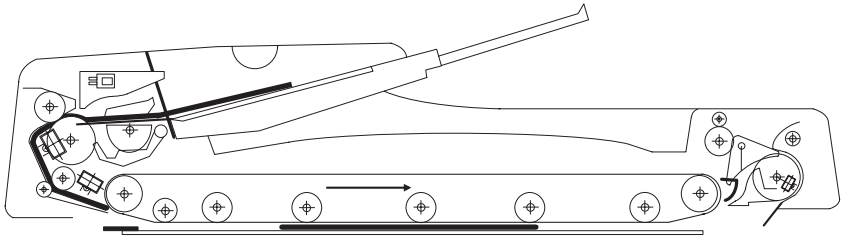


Figure 2-30. Reverse Feeding (Step 12)

13. The transportation motor rotates forward and then the paper feed motor rotates backward to transport the pre-fed document to the platen glass. The document size is measured when the registration sensor goes off, and the paper feed motor stops when the timing sensor goes off. The flapper solenoid also comes on to switch the paper path to the paper eject/reverse mechanism side.

14. After the paper feed motor stops, the transportation motor starts transporting the document and stops when the leading edge of the document is near the paper eject/reverse mechanism to wait for the scanned document to be ejected completely. In case the empty sensor goes off while transporting, the shutter solenoid goes off.

15. After the scanned document is ejected, the flapper solenoid comes on to switch the paper path to the paper eject/reverse mechanism side. The transportation motor and the paper eject/reverse motor rotate forward to transport the fed document to the paper eject/reverse mechanism.

16. When the paper eject/reverse sensor comes on, the transportation motor stops. Then the paper eject/reverse motor stops to hold the document in the paper eject/reverse mechanism.

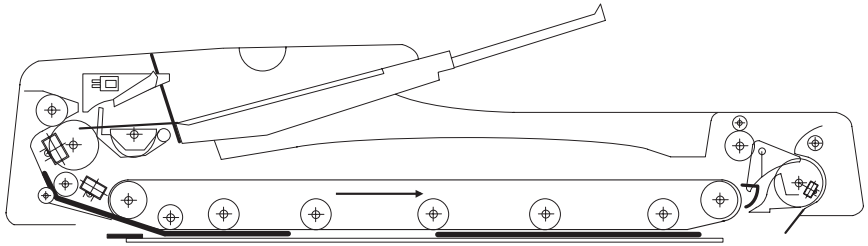


Figure 2-31. Reverse Feeding (Step 13)

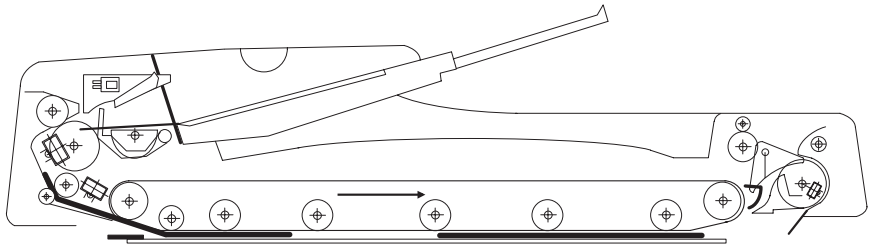


Figure 2-32. Reverse Feeding (Step 14)

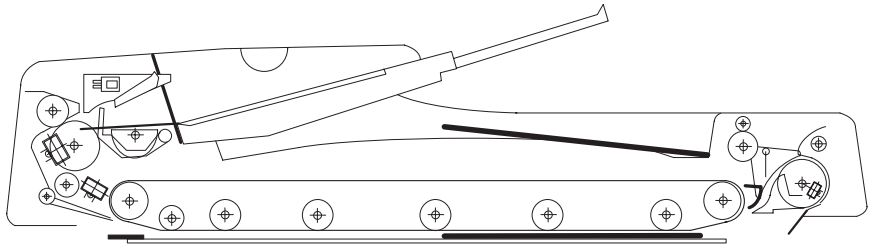


Figure 2-33. Reverse Feeding (Step 15)

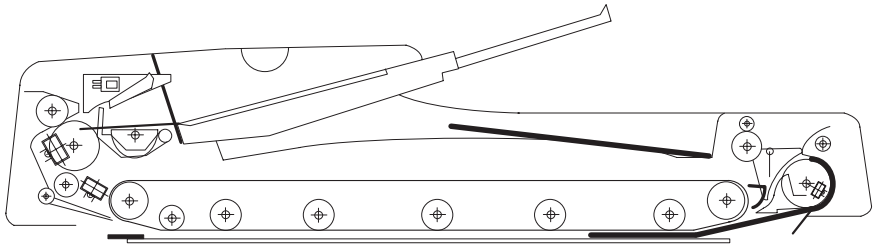


Figure 2-34. Reverse Feeding (Step 16)

17. The transportation motor rotates backward and then the paper eject/reverse motor rotates forward to transport the document from the paper eject/reverse mechanism to the scanning position. The paper eject/reverse motor stops when the paper eject/reverse sensor goes off and the transportation motor stops when the document bumps against the paper stopper. Document transportation stops when the flapper solenoid goes off. With the document set for scan, the ADF sends the paper feeding complete signal to the scanner, and the scanner starts scanning.

18. After scanning, the ADF starts transporting the scanned document back to the scanning position via the paper eject/reverse mechanism. The transportation motor and the paper eject/reverse motor rotate forward to transport the scanned document to the paper eject/reverse mechanism and the flapper solenoid comes on to switch the paper path to the paper eject/reverse mechanism side.

19. When the paper eject/reverse sensor comes on, the transportation motor stops and then the paper eject/reverse motor stops to hold the document in the paper eject/reverse mechanism.

20. The transportation motor rotates backward and then the paper eject/reverse motor rotates forward to transport the document from the paper eject/reverse mechanism to the scanning position. The paper eject/reverse motor stops when the paper eject/reverse sensor goes off and the transportation motor stops when the document bumps against the paper stopper. With the document set for scan, the ADF sends the paper feeding complete signal to the scanner, and the scanner starts scanning.

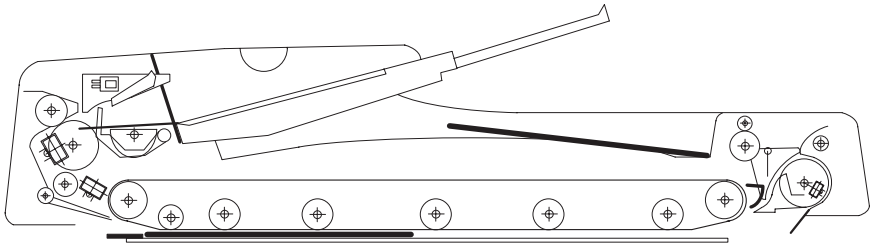


Figure 2-35. Reverse Feeding (Step 17)

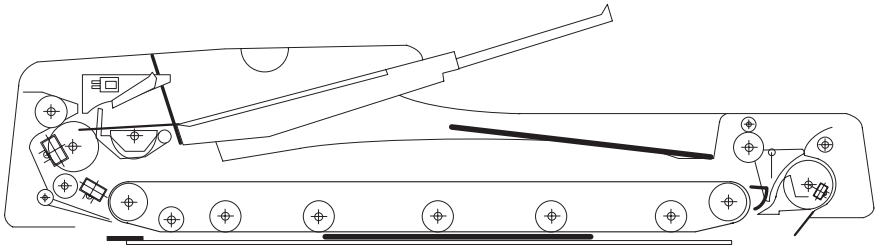


Figure 2-36. Reverse Feeding (Step 18)

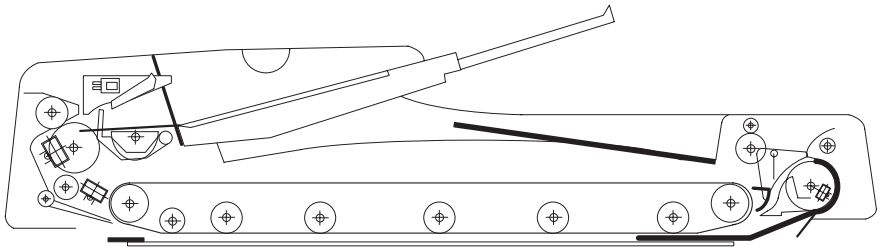


Figure 2-37. Reverse Feeding (Step 19)

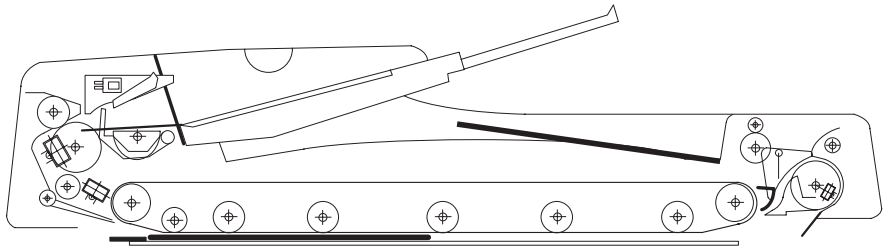


Figure 2-38. Reverse Feeding (Step 20)

21. According to the ejection command from the scanner, the scanner starts ejecting the scanned document. The transportation motor and the paper eject/reverse motor rotate forward to eject the scanned document.

22. When the paper eject/reverse sensor is near off condition, rotational speed of the paper eject/reverse motor is reduced to eject the document slowly to the output tray. The transportation motor stops when the paper eject/reverse sensor goes off.

23. The paper eject/reverse motor stops after the document is ejected to the output tray and the ADF sends the operation complete signal to the scanner.

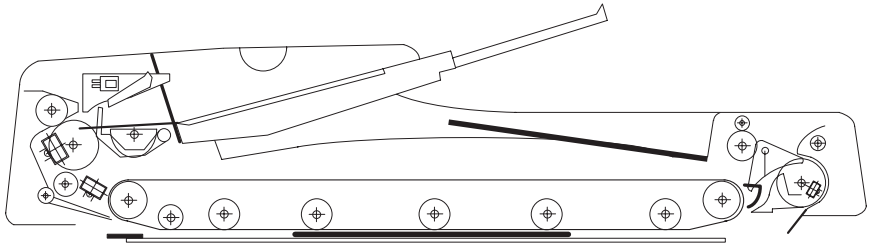


Figure 2-39. Reverse Feeding (Step 21)

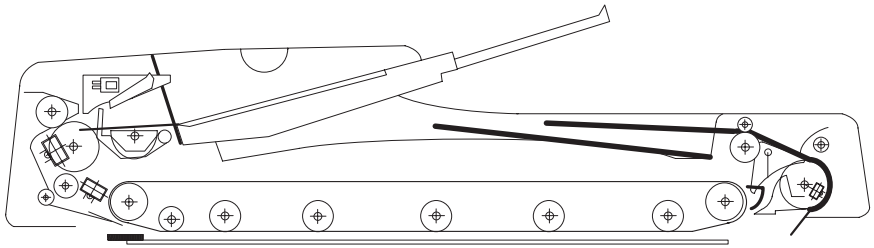


Figure 2-40. Reverse Feeding (Step 22)

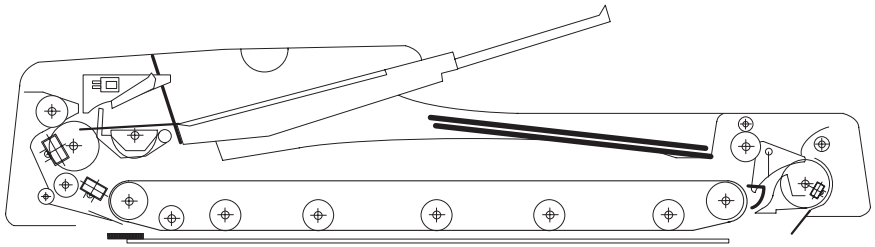


Figure 2-41. Reverse Feeding (Step 23)

2.1.2 Electrical Circuit

This ADF (R-4C1070).is equipped with only one control board. This section describes the functions of the board.

2.1.2.1 Transmission Circuit

The transmission circuit manages parallel and serial signal transmission between the ADF and the scanner. The protocol used between them is original.

- Serial transmission
  IC11 is the transceiver used for the serial transmission. It receives output signal from the CPU and separates them according to the signal types; reversed or non-reversed, then it outputs the signals to the scanner from DO1. 2 signals (RI1 and RI2) sent from the scanner are combined into 1 signal and output from the RO1.

- Parallel transmission
  Signals sent from the CPU is output at the open collector via IC1 and IC3. Signals from the scanner are transferred to the CPU via the pull-up resistor.

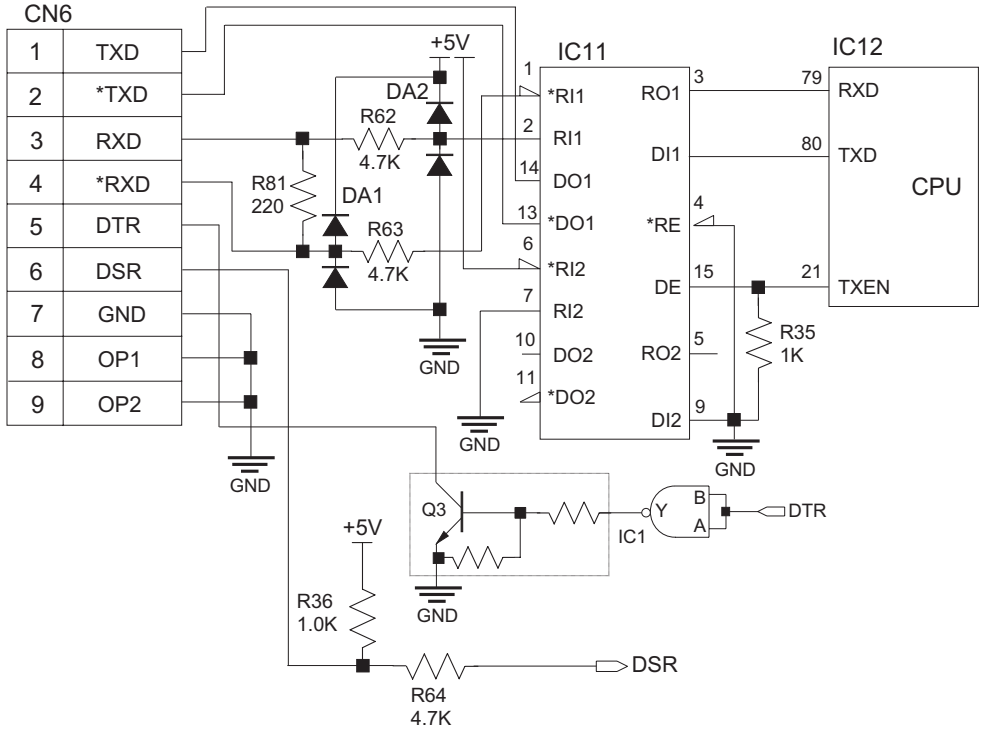


Figure 2-42. Transmission Circuit Block Diagram

2.1.2.2 Paper Size Detection Circuit

The edge guides in the paper feed tray of this ADF are used to detect the paper size. As they move, slide resistance changes in accordance with the distance between them. The resistance is then converted into analog data and transferred to the CPU, where the paper size is determined. This circuit consists of the RC noise filter.

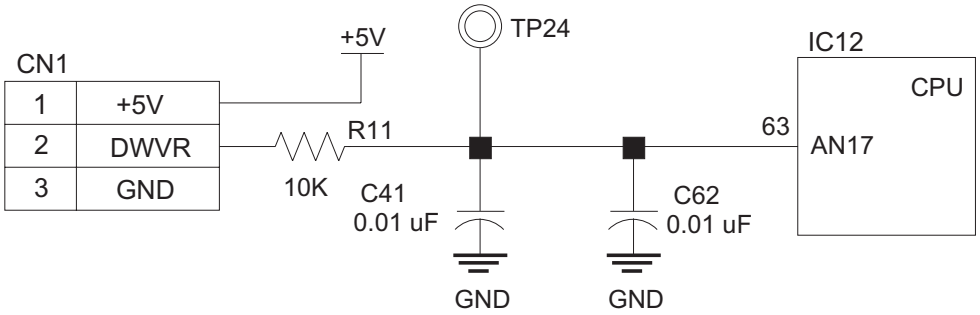


Figure 2-43. Document Width Detection Circuit Block Diagram

2.1.2.3 Document Sensor (Empty Sensor) Circuit

A photo-interrupter sensor located at the bottom of the paper feed tray is used to detect document. The ADF determines whether or not it continues pre-feeding based on the signal sent from this sensor. The signal is transferred to the CPU via the resistors only.

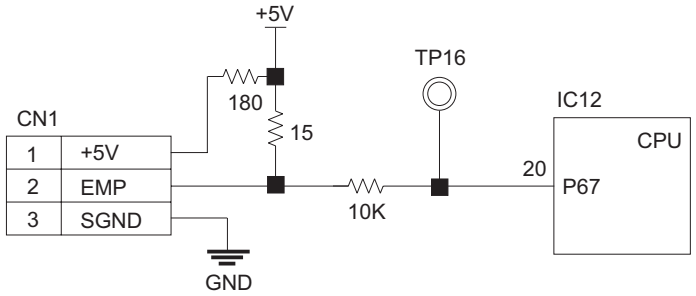


Figure 2-44. Document Sensor Circuit Block Diagram

2.1.2.4 Paper Feeding Motor Encoder Sensor Circuit

The paper feeding motor is used to manage the following operations:

- ❑ Registration operation
- ❑ Drives the transportation motor after the timing sensor goes off.
- ❑ Controlling backward rotation of the motor

Since this motor is used for various operations, the motor rotation must be precisely controlled. Failure in controlling the motor does not guarantee prompt feeding, or may result in jamming caused by the document inserted over the document remaining in the ADF. The motor rotation is controlled according to the signal form the photo-interrupter which detects the slid plate directly attached to the motor shaft. The signal is output to the CPU via the resistors only.

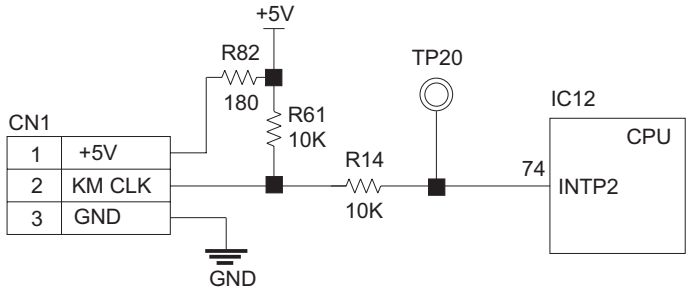


Figure 2-45.
Paper Feeding Motor Encoder Sensor Circuit Block Diagram

2.1.2.5 Registration Sensor Circuit

The registration sensor with an LED and the photo transistor built in has an mirror attached across the paper path. Since the registration sensor is a reflex type sensor, it detects paper empty condition by emitting infrared light from the LED toward the mirror and receiving the light reflected on the mirror.

The voltage input to the sensor is divided by R55 and R56, and 1/3 of the original level is input to the AD converter of the CPU. (Actually, it is regulated to 5 V by D2.) Analog data for the input voltage is output one after another in a rectangle waveform from IC4 via PWM circuit in the gate array. This PWM signal is integrated via R3 and C6 of the C,R circuit and converted into the analog voltage. Then it is amplified by the non-reverse amplifier to establish the reference value for the comparator. Therefore, the reference value is set to 1/3 of the High level of each sensor output timing. In case the voltage level input to the AD converter of the CPU drops below 1.6 V, the CPU outputs High from Pin 48 to increase LED emission.

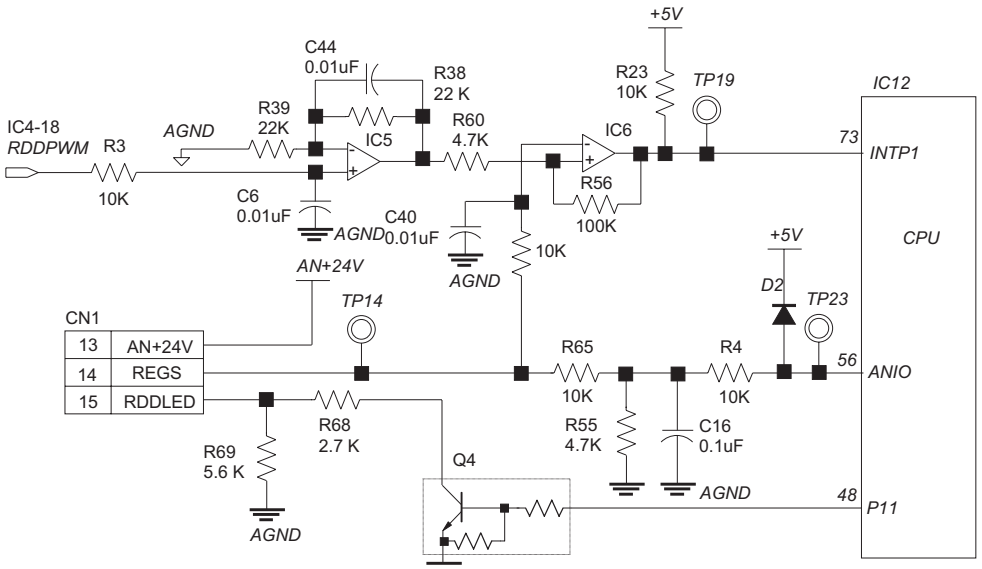


Figure 2-46. Registration Sensor Circuit Block Diagram

2.1.2.6 Sensor Circuits

The timing sensor and the paper eject/reverse sensor are reflex type sensors, and each of them has an LED and photo-transistor built in it. Each sensor emits infrared light from the LED toward the mirror attached across from the sensor and detects paper empty condition when it receives the infrared light reflected on the mirror.

The cathode of the LED is connected to the collector of Q3. Current output to the photo diode is controlled at the terminal AN0 of the CPU. Photoelectric current from the photo transistor is converted into voltage via the resistor in the input circuit of the sensor, and is input to the comparator, where the voltage level is compared with the reference voltage (2V).

If the input voltage is higher than the reference voltage, it means the paper empty condition, and the compactor outputs a Low signal to the CPU. Since sensors are generally produced with uneven sensitivities, the CPU adjusts the input voltage from the sensor to the specified level. When the ADF is turned on under the paper empty condition, the input voltage (analog data) from the sensor is input to the CPU as a digital data. The CPU then manipulates the data to make the proper level of output voltage (analog data). After this process, the current flows to the LED changes and the input voltage from the sensor is adjusted to the proper level as the result.

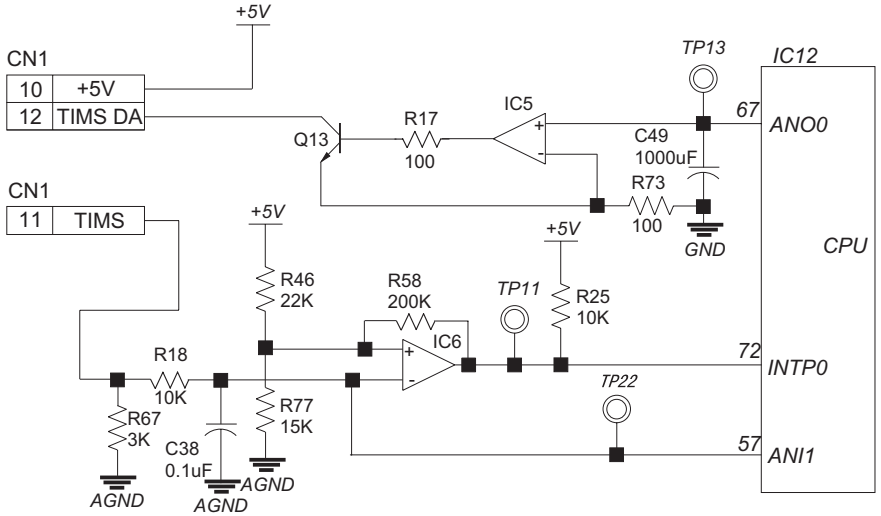


Figure 2-47.
Timing Sensor Circuit / Reverse Sensor Circuit Block Diagrams

2.1.2.7 Switch Circuits

Each of the ADF, feeding cover and ejection cover is equipped with a open/close sensor to detect status such as operation stop and error occurrence. These open/close mechanisms are used when removing jammed documents or setting documents manually. The circuits for the sensors have the same layout and each of the circuits inputs 5 V directly to the CPU via the Zener diode and the transistor with internal resistors integrated to detect conditions.

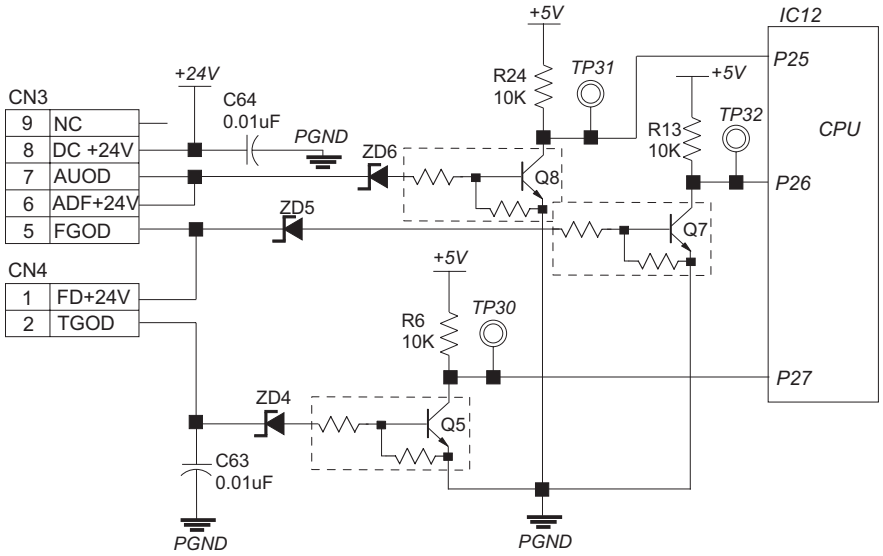


Figure 2-48. Open/Close Sensor Circuit Black Diagram

2.1.2.8 Reset Circuit

This circuit produces reset signals sent to the CPU and the gate array. IC8 has the following 2 functions:

- ❑ Power-on reset at power-on time
- ❑ Resets when 5 V is at an abnormally low level.

After power-on, reset condition is kept until the voltage level for IC8 rises to 4.3 V. This circuit is also equipped with WDT used when the CPU is running away. It is to allow the CPU itself to output the reset signal.

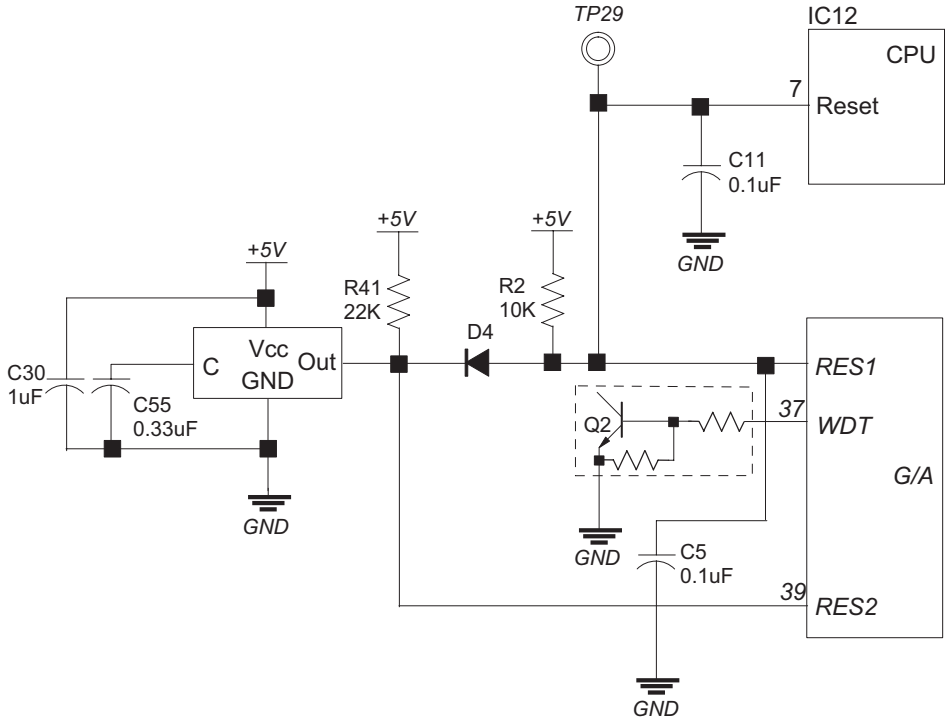


Figure 2-49. Reset Circuit

2.1.2.9 Paper Feed Motor Driver Circuit

This ADF is equipped with 3 motors, and a DC motor is used for the paper feed motor only. The paper feed motor has a slit plate which detects conditions such as amount and directions of motor rotation and stop control status. The paper feed motor driver circuit sends signals to the CPU according to the motor status detected by the slid plate. The signals for rotation direction and stop control fed back to the CPU are transferred to the gate array via data bus, where the signals are combined and decoded into one, and output from Pin 65 - Pin 68 as a control signal. Since this motor is a phase 2 DC motor, the motor control HIC (IC3) is finally output from Pin 2.

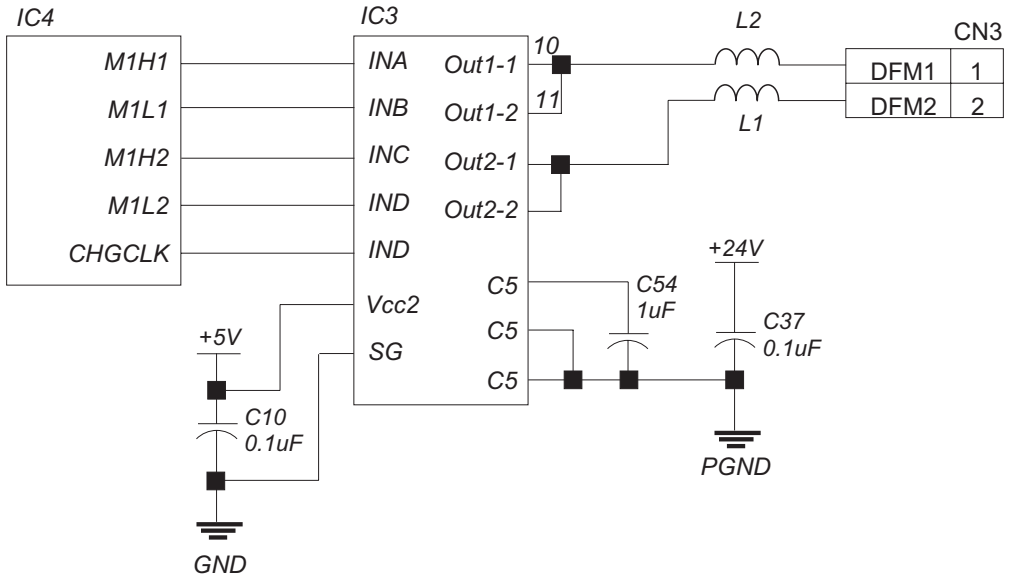


Figure 2-50. PF Motor Driver Circuit

2.1.2.10 Transportation/Paper Eject/Reverse Motor Driver Circuits

Stepping motors are used for the transportation motor and the paper eject/reverse motor. Each motor circuit controls constant current for the motor phase as well as direction for rotating and motor stopping . Phase excitation signals are input to Pins 13 - 16 of the IC7. Since this motor is driven by the constant current, PWM signal is output from Pin 17 of the gate array after current is input to the motor phase to regulate the current via the chopping regulator.

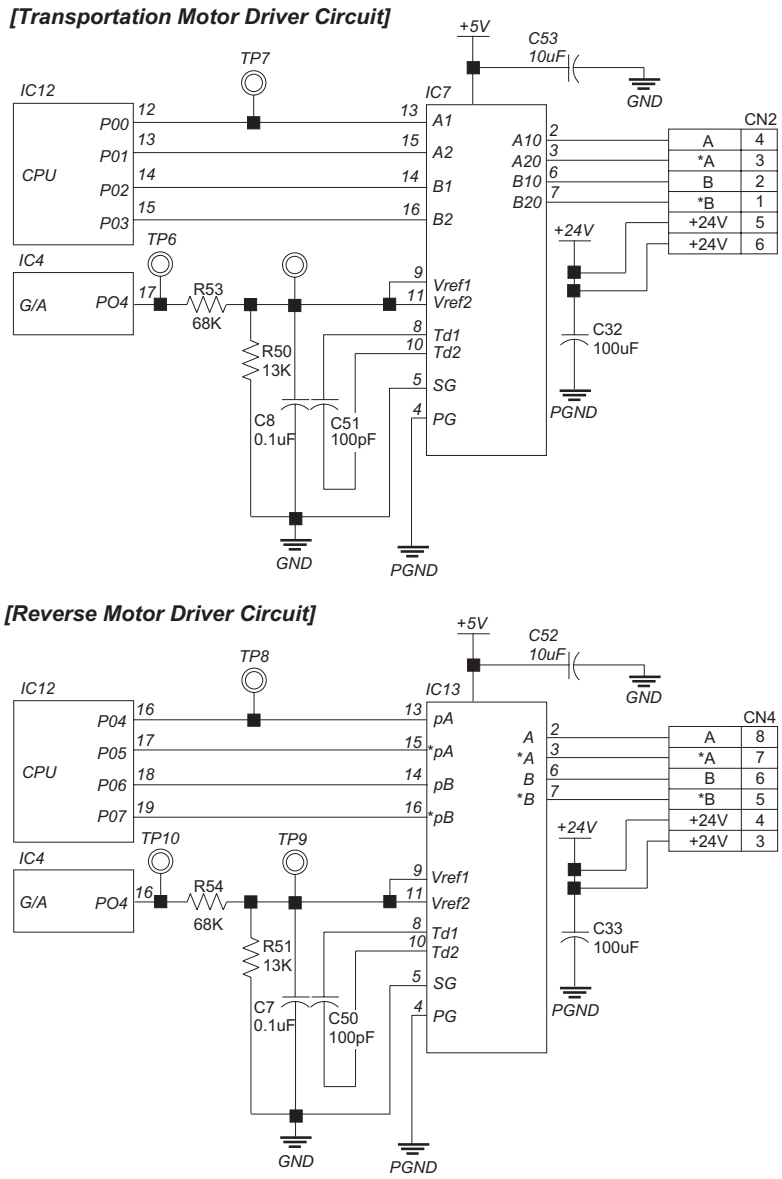


Figure 2-51.
Transportation & Paper Eject/Reverse Motor Driver Circuit Block Diagrams

2.1.2.11 Feeding Solenoid/Reverse Solenoid Sensor Circuits

This ADF is equipped with 2 solenoids; one is a feeding solenoid used for opening and closing the paper feed shutter, and the other is a flapper solenoid which drives the flapper used to reverse the document. In each circuit, the gate array outputs a signal to activate the FET. The coil inside the solenoid is then energized by the FET operation to produce magnetic field, and the iron core is induced as the result.

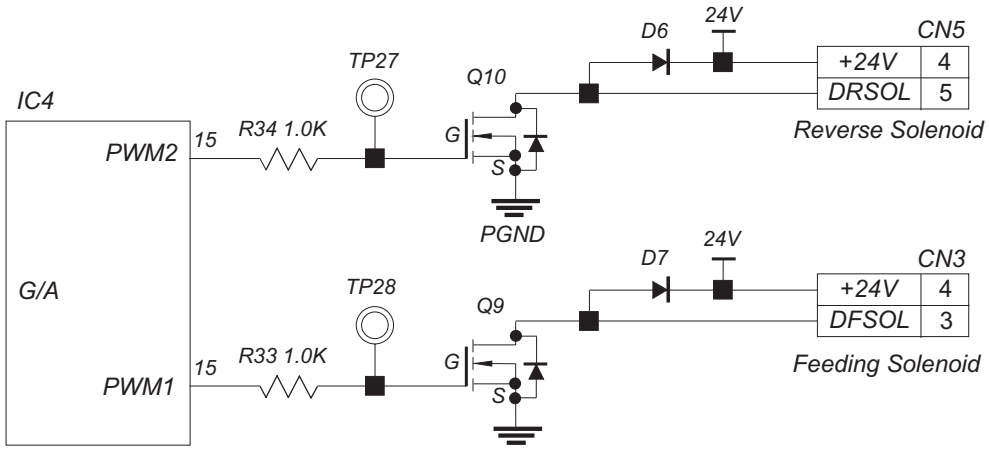


Figure 2-52. Solenoid Driver Circuit Block Diagram

2.1.2.12 Rush Current Limitation Circuit

The rush current limitation circuit consists of the limitation resistance and the FET which regulates the current level. Through this circuit, the level of the rush current which flows into the current regeneration condensers in the transportation and the paper eject/reverse motor circuits is suppressed at a proper level. When the ADF is turned on or ADF, paper feeding cover and the ejection cover are closed, current flow is limited by the limitation resistor (R31) until the cathode voltage for ZD3 rises to the specified level.

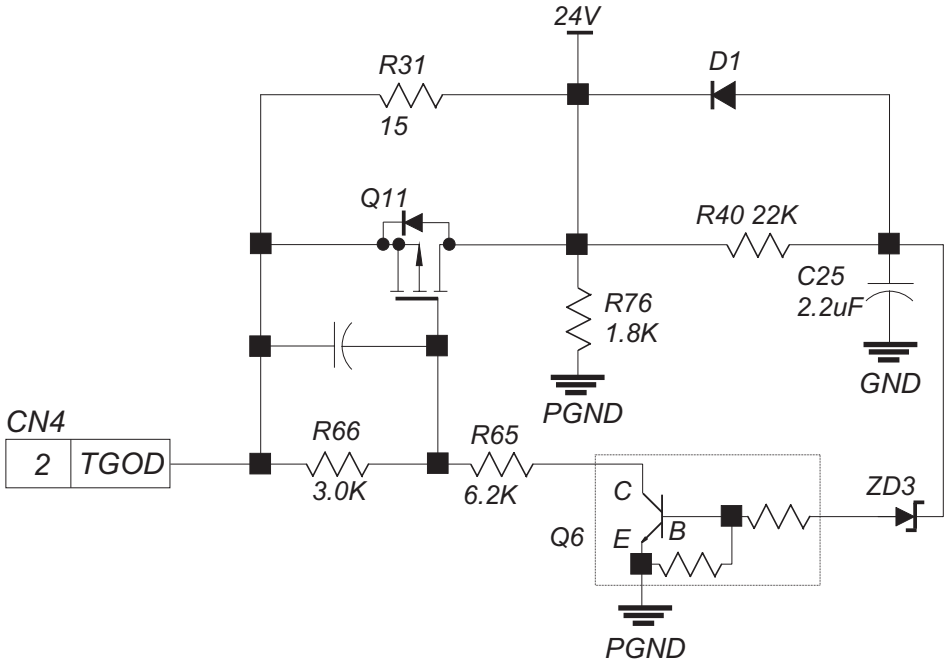


Figure 2-53 Rush Current Limitation Circuit

2.1.2.13 EEPROM Transmission/Write Circuit

Following values can be written into the EEPROM of this ADF:

- ❑ Reference value for the empty sensor sensitivity
- ❑ Reference value for the registration sensor sensitivity
- ❑ Reference value for the paper eject/reverse sensor sensitivity
- ❑ Total amount of fed document

To rewrite sensitivity values for the sensors listed above or initialize the EEPROM, run the automatic adjustment program built in the ROM.

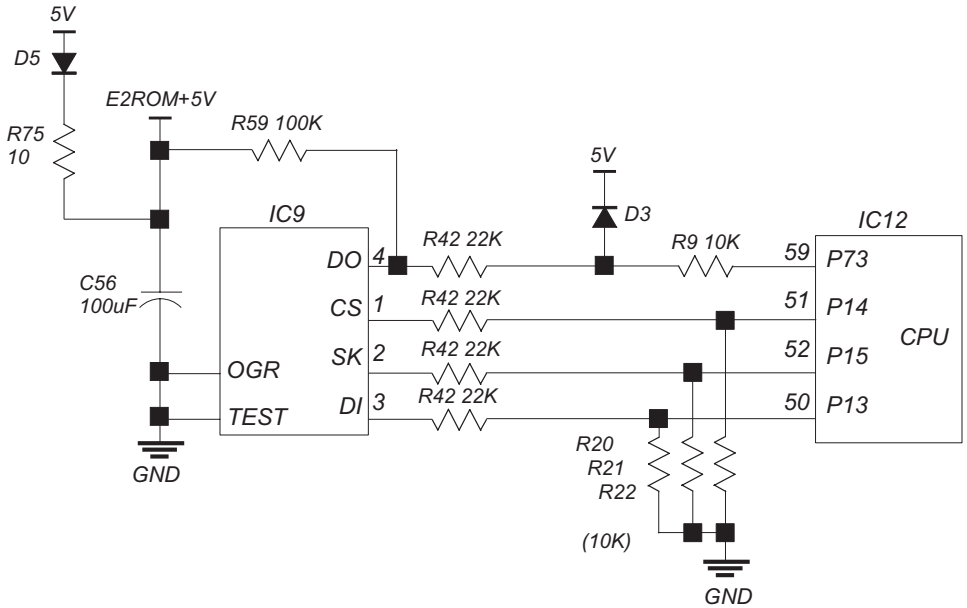


Figure 2-54. EEPROM Transmission/Write Circuit

CHAPTER

3

TROUBLESHOOTING

3.1 OVERVIEW

This chapter describes the troubleshooting required when this ADF functions abnormally. Generally, defective part can be found easily by running various test modes as long as the ADF is in operation. The test modes are described in the following sections.

3.1.1 Test Mode Overview

This ADF is equipped with 6 test modes. After activating each mode, you can roughly isolate the defective part according to the blinking pattern of the LED. Use of functions of these modes also brings you an early detection of the defective part at the on-sight service. However, you can refer to the resistance values for the motors and solenoids shown in Appendix as the error indication with LED is not distinguishable enough.

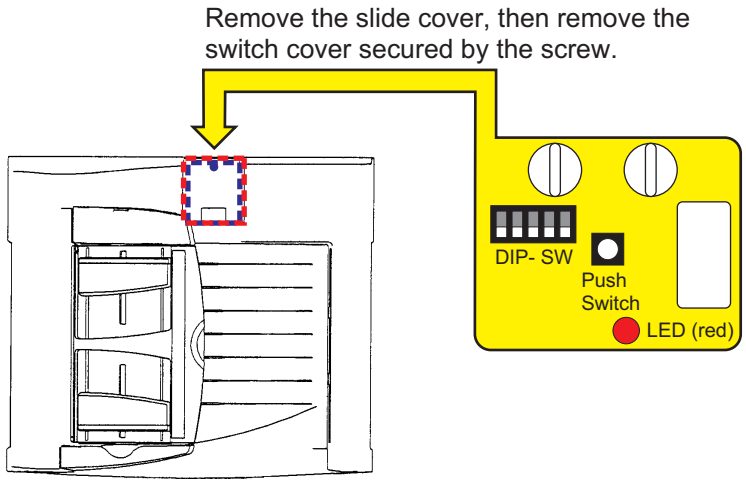


Figure 3-1. SW Cover Removal

Table 3-1. Test Modes and Test Methods

No.	Test Mode	Test Method
1	Single feeding mode	Feed the paper in the single feeding mode and check the operation.
2	Reverse feeding mode	Feed the paper in the reverse feeding mode and check the operation.
3	Single feeding without paper aging mode	Without any document set, the ADF performs single paper feeding motion at a high speed.
4	Reverse feeding without paper aging mode	Without any document set, the ADF performs reverse paper feeding motion at a high speed.
5	Motor line output check mode	Drive 3 motors in the ADF and check for the proper operations.
6	Solenoid line output check mode	Activate 2 solenoids in the ADF and check for the proper operations.

✓CHECK POINT

- ***If a sensor error occurs during a test mode, see Chapter 5 and perform any necessary adjustment.***
- ***If an error occurs during a test mode, refer to Table 3-2 and take proper actions.***

Table 3-2. Error Indication during the Test Modes

No.	LED Indication	Corresponding ADF Condition
1	Blinks (Interval: 1000 msec)	Test is done without any error.
2	Blinks (Interval: 500 msec)	Sensor error or motor error has occurred.
3	Blinks (Interval: 50 msec)	Paper is jamming.

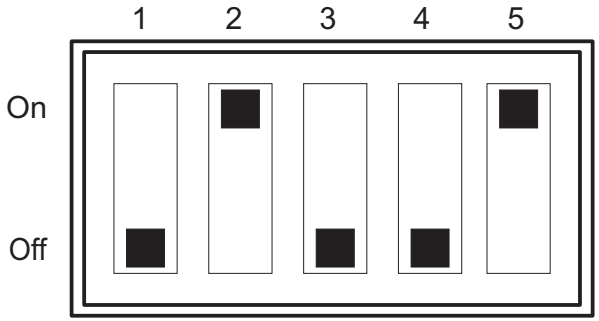
3.1.1.1 Single Feeding Test Mode

With this test mode, you can detect the defective part by setting the document (including a blank paper) and performing the single feeding.

✓CHECK POINT

Abnormal phenomenon does not necessary determine the test mode to be performed. Therefore, performing all test modes listed in Table 3-1 one by one in the listed order is recommended.

Step 1. Place the ADF on the scanner and set it ready for power-on.
Step 2. Set the Dip-switch on the control as shown below.



Step 3. Turn the scanner on, and open and then close the either feeding cover or eject cover. (The test mode is set with this action.)
Step 4. Press the push switch on the control board.

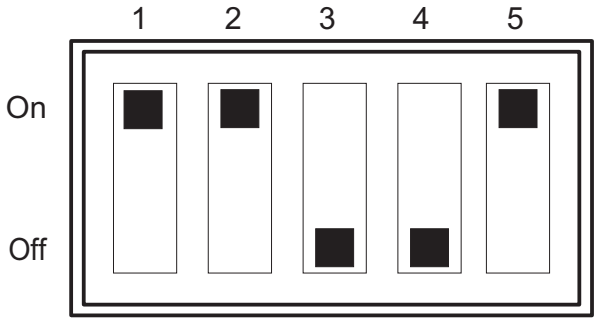
✓CHECK POINT

If the paper jam error occurs, open and close either feeding or eject cover to clear the error status.

3.1.1.2 Reverse Feeding Test Mode

With this test mode, you can detect the defective part by setting the document (including a blank sheet) and performing the reverse feeding.

Step 1. Place the ADF on the scanner and set it ready for power-on.
Step 2. Set the Dip-switch on the control board as shown below.



Step 3. Turn the scanner on, and open and then close the either feeding cover or eject cover. (The test mode is set with this action.)
Step 4. Press the push switch on the control board.

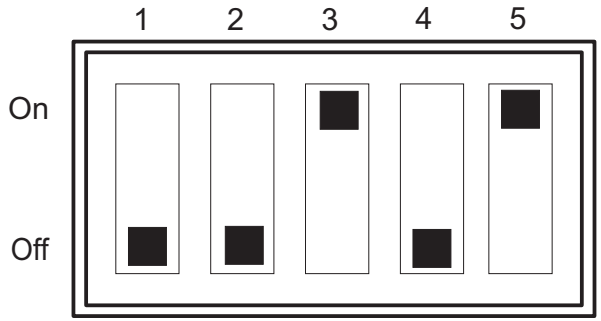
3.1.1.3 Single Feeding Without Paper Aging Test Mode

With this test mode, you can detect the defective part by putting the ADF in the single feeding aging mode without setting any document.

⚠CAUTION ***Do not feed any document during this test mode, or the document may be damaged.***

✓CHECK POINT ***Feeding timing varies depending on the setting condition of the Dip-switch No.5, as shown below:***
Switch = On: Timing for A3
Switch = Off: Timing for A4

Step 1. Place the ADF on the scanner and set it ready for power-on.
Step 2. Set the Dip-switch on the control board as shown below.



Step 3. Turn the scanner on, and open and then close the either feeding cover or eject cover. (The test mode is set with this action.)
Step 4. Press the push switch on the control board.

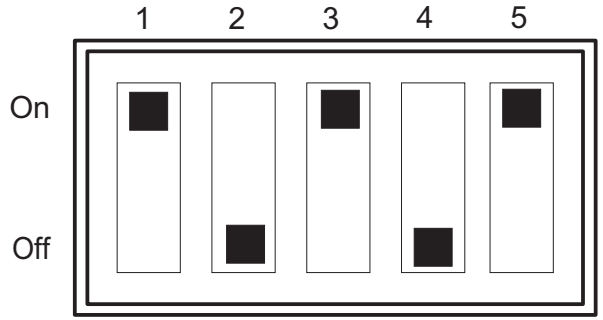
3.1.1.4 Reverse Feeding Without Paper Aging Test Mode

With this test mode, you can detect the defective part by putting the ADF in the reverse feeding aging mode without setting any document. Note that the abnormal phenomenon does not necessary determine the test mode to be performed. Therefore, Performing all test modes listed in Table 3-1 one by one in the listed order is recommended. The test method is as shown below:

⚠CAUTION ***Do not feed any document during this test mode, or the document may be damaged.***

✓CHECK POINT ***Feeding timing varies depending on the setting condition of the Dip-switch No.5, as shown below:***
Switch = On: Timing for A3
Switch = Off: Timing for A4

Step 1. Place the ADF on the scanner and set it ready for power-on.
Step 2. Set the Dip-switch on the control as shown below.

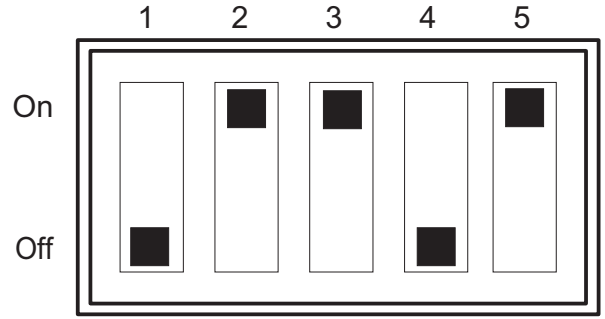


Step 3. Turn the scanner on, and open and then close the either feeding cover or eject cover. (The test mode is set with this action.)
Step 4. Press the push switch on the control board.

3.1.1.5 Motor Line Output Test Mode

With this test mode, you can detect the defective part by driving 3 motors consecutively.

Step 1. Place the ADF on the scanner.
Step 2. Set the Dip-switch on the control as shown below.



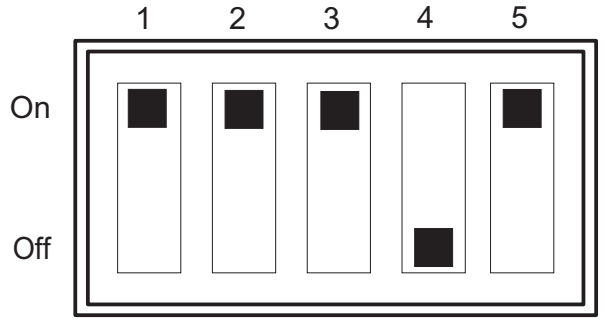
Step 3. Turn the scanner on, and open and then close the either feeding cover or eject cover. (The test mode is set with this action.)
Step 4. Press the push switch on the control board. The motors are driven one by one in the order listed below as the switch is pressed each time.

1)	Feeding motor:	Forward rotation for 150 m Sec. (Weight shutter solenoid: On)
2)	Feeding motor:	Backward rotation for 150 m sec.
3)	Feeding motor:	Backward rotation for 400 m sec.
4)	Transportation motor:	Forward rotation for 400 m sec.
5)	Transportation motor:	Backward rotation for 250 m sec.
6)	Transportation motor:	Backward rotation for 400 m sec.
7)	Reverse Motor:	Forward rotation for 250 m sec.
8)	Reverse Motor:	Forward rotation for 400 m sec.
9)	Reverse Motor:	Forward rotation for 400 →250 m sec

3.1.1.6 Solenoid Line Output Test Mode

With this test mode, you can activate 2 solenoids to check for the correct operation.

Step 1. Place the ADF on the scanner.
Step 2. Set the Dip-switch on the control board as shown below.



Step 3. Turn the scanner on, and open and then close the either feeding cover or eject cover. (The test mode is set with this action.)
Step 4. Press the push switch on the control board. The solenoids are activated in the order listed below as the switch is pressed each time.

1) Weight shutter solenoid
2) Flapper solenoid

3.1.2 Motor/Solenoid Internal Coil Resistance

This section provides the check points for the motors which are found defective through the test modes described in Section 3.1.1.

✓CHECK POINT

- ***Since a DC motor is used for the paper feeding motor, check continuity for 2 lines in case this motor is found defective.***
- ***The reference coil resistance for the DC motor is 3.4 Ω. However, do not judge the motor condition based on the value, because current is measured to check the motor condition only.***

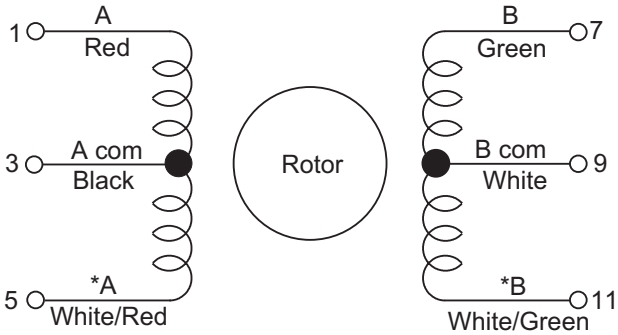


Figure 3-2. Internal Connection of the Transportation Motor

3.1.2.1 Transportation Motor Check Points

A 4-phase motor is used for the transportation motor. The coil resistance between each coil is 1.1Ω ± 10%. Figure 3-2 shows the internal connection of the transportation motor.

The connector is directly soldered onto the transportation motor. See Figure 3-3 which shows pin configuration appears when the connector is removed.

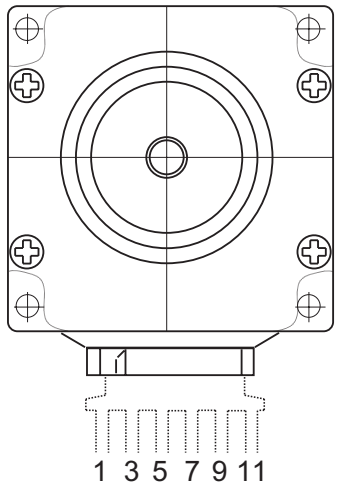


Figure 3-3. Transportation Motor Pin Configuration

3.1.2.2 Paper Eject/Reverse Motor Check Point

A 4-phase stepping motor is also used for the paper eject/reverse motor, and coil resistance between each coil is 2.6Ω ± 10%. Internal coil connection is shown below.

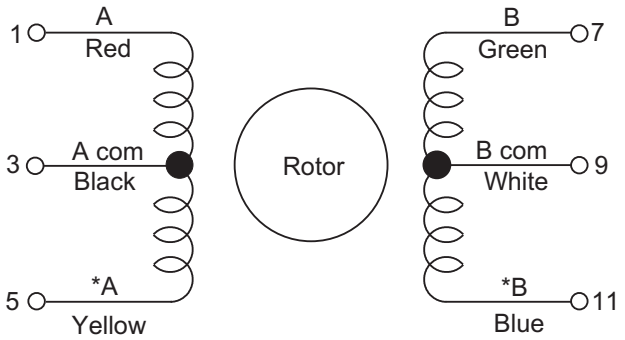


Figure 3-4. Internal Connection of the Reverse Motor

3.1.2.3 Solenoid Check Point

This ADF is equipped with 2 solenoids; shutter weight solenoid and reverse solenoid. They are easily activated by turning on the coils. Therefore, you can check the condition of the solenoid by measuring the resistance between 2 pin cables. Refer to Table 3-3 for the correct resistance of the solenoids.

Table 3-3. Solenoid Resistance

Solenoid	Coil Resistance
Shutter weight solenoid	28 Ω ± 10%
Reverse solenoid	80 Ω ± 10%

3.1.2.4 Paper Size Sensor

Size of the document set in the ADF paper tray is detected by aligning the edge guide with the document. The document width measured by the edge guides is converted into the corresponding sliding resistance, which is fed back to the scanner. Since failure in outputting appropriate VR causes the scanner to operate inappropriately for the document size, the sensor must be checked for the correct resistance when necessary. Refer to Table 3-4 for different document sizes and corresponding VR output values.

Table 3-4.
Document Size and Corresponding VR Output

Document Size	VR Output
B5 (Portrait)	3.53 to 3.18 V
A4 (Portrait)	2.78 to 2.47 V
B5 (Landscape)	1.53 to 1.27 V
A4 (Landscape) A3 (Portrait)	0.45 to 0.27 v

CHAPTER

4

DISASSEMBLY AND ASSEMBLY

4.1 OVERVIEW

This chapter describes how to dissemble the auto document feeder (ADF). If no instruction is given, assembly can be carried out by reversing the disassembly procedures.

⚠CAUTION ***Since the ADF consists of many metal frames, be careful not to cut yourself with the frame edges.***

4.1.1 Tools

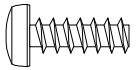
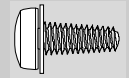
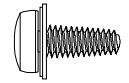
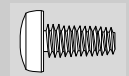
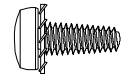
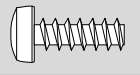
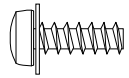
The tools required to disassemble/assemble the TPU are as listed below:

Tool Name	Availability	SE Part No.
Phillips screw driver (No.2)	○	
Thickness gauge set (#F518)	SE exclusive	B776702201

4.1.2 Screws

Types of screws used for the ADF are listed in the table below. Make sure that you use the specified type and number of screws for each part.

Table 4-1. Screw List

No.	Screw Type / Specification	Appearance	Color
1	CBP M3x12		Silver
2	CBS Sems M3x8		Silver
3	CBS Sems (2) M3x6		Red copper
4	CBS M3x6		Red copper
5	CPS Sems B M3x5		Red copper
6	CBP M3x10		Black
7	CB with toothed washer M3x12		Gold

4.2 DISASSEMBLY PROCEDURE

Disassembly/Removal procedures for the major units in the ADF are described in the following sections.

4.2.1 Paper Feed Tray Removal

1. Remove the ADF unit from the scanner body.
2. Move the edge guides (blue) to the center.
3. Remove 2 screws and remove the paper feed tray along with the extension tray.
4. Turn the tray over and disconnect the connector cable for the paper size sensor from the relay connector.

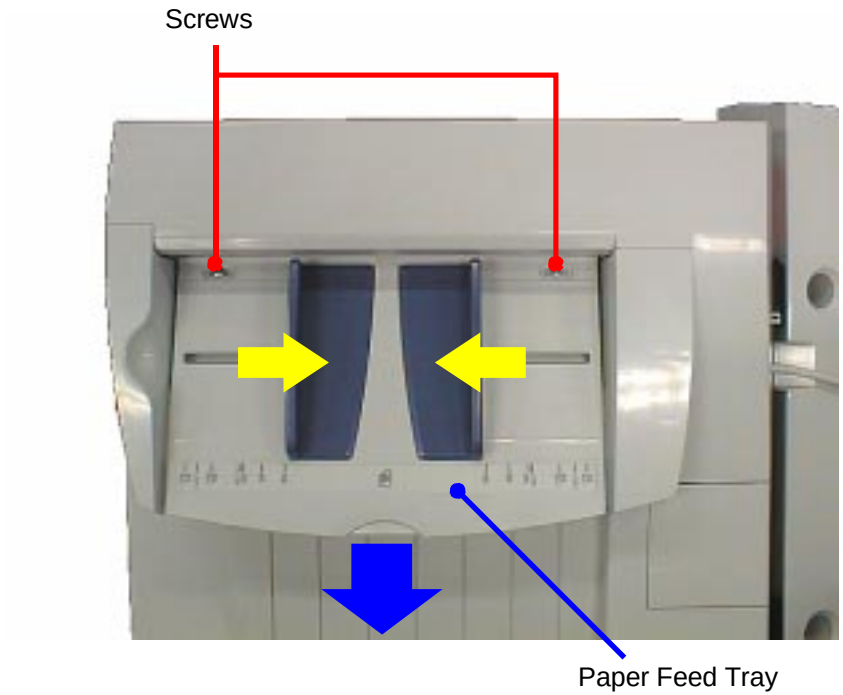


Figure 4-1. Paper Feed Tray Removal

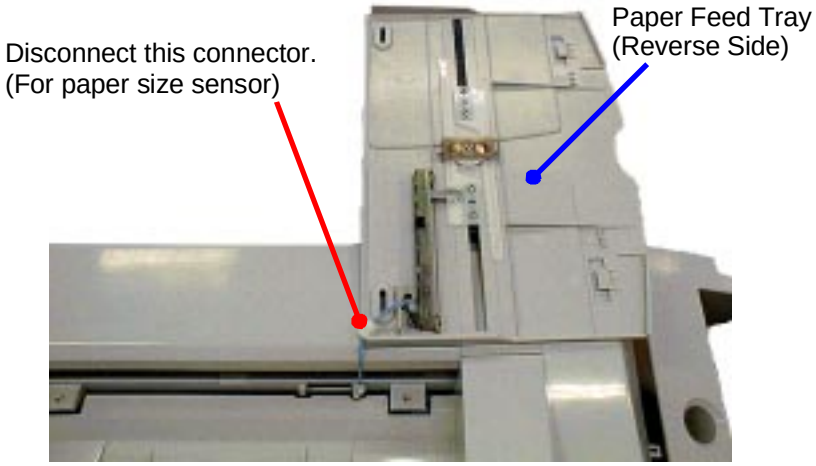


Figure 4-2. Connector Removal

4.2.2 Control Board Unit Removal

1. Turn the ADF over and remove 3 screws, then remove the shield cover.
2. Disconnect all connector cables from the connectors on the control board. (See Figure 4-4 for connector location indicated with the yellow broken lines.)
3. Remove 2 screws and remove the control board unit.

✓CHECK POINT ***When installing the control board unit, make sure that the bottom edge of the board properly fits in the edge holder.***

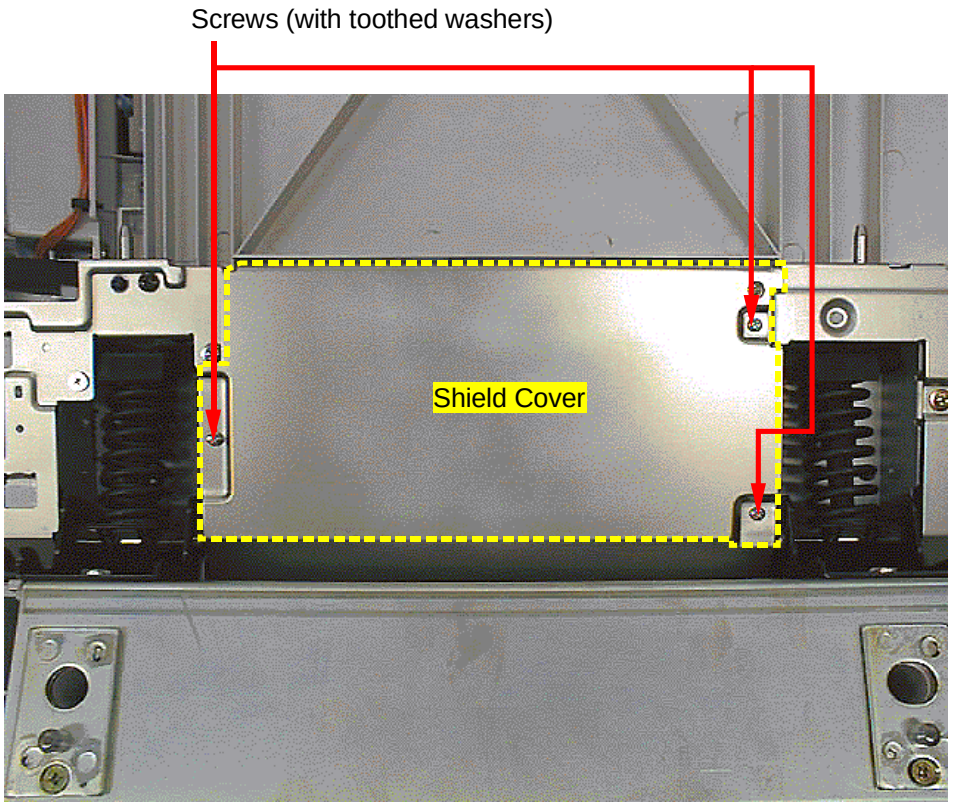


Figure 4-3. Shield Cover Removal

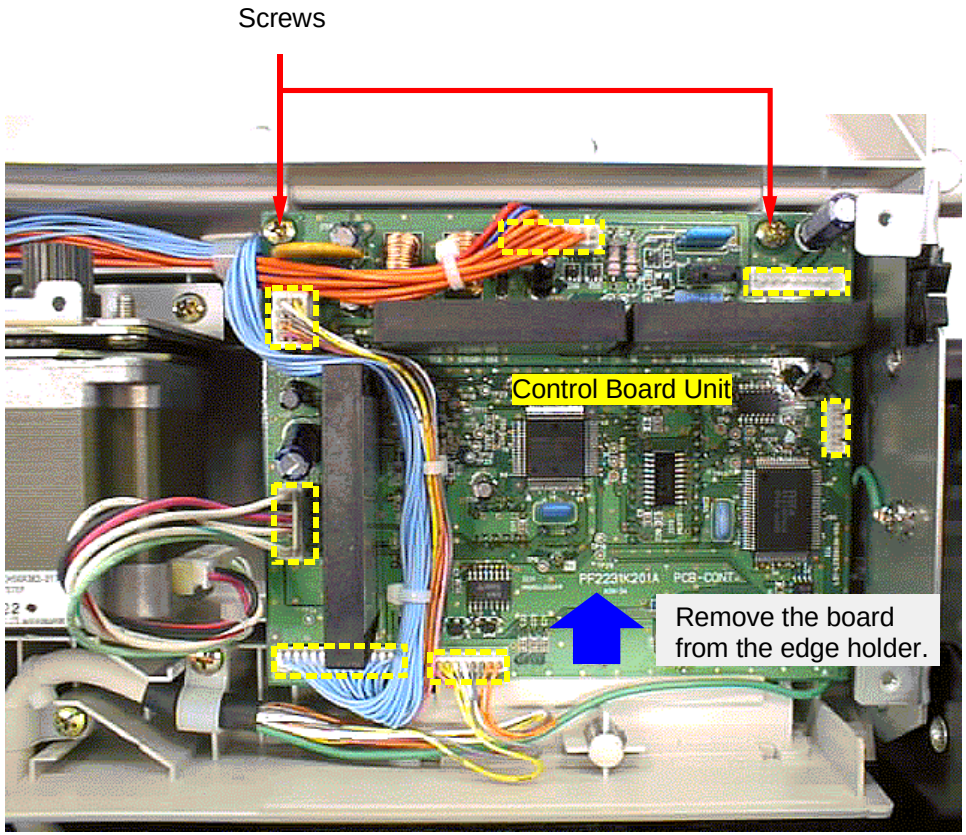


Figure 4-4. Control Board Unit Removal

4.2.3 Transportation Belt Unit Removal

1. Turn the ADF over.
2. Fold 2 areas of the belt (indicated areas in Figure 4-5.) inside.
3. Remove 2 right and left transportation belt unit fixing screws indicated in Figure 4-6, then hold the top edge of the belt and pull it forward and remove the whole belt unit by pulling it upward.

✓CHECK POINT

When reinstalling the transportation belt unit, ensure that the drive transmission belt is properly engaged with the belt drive gear at the lower left .

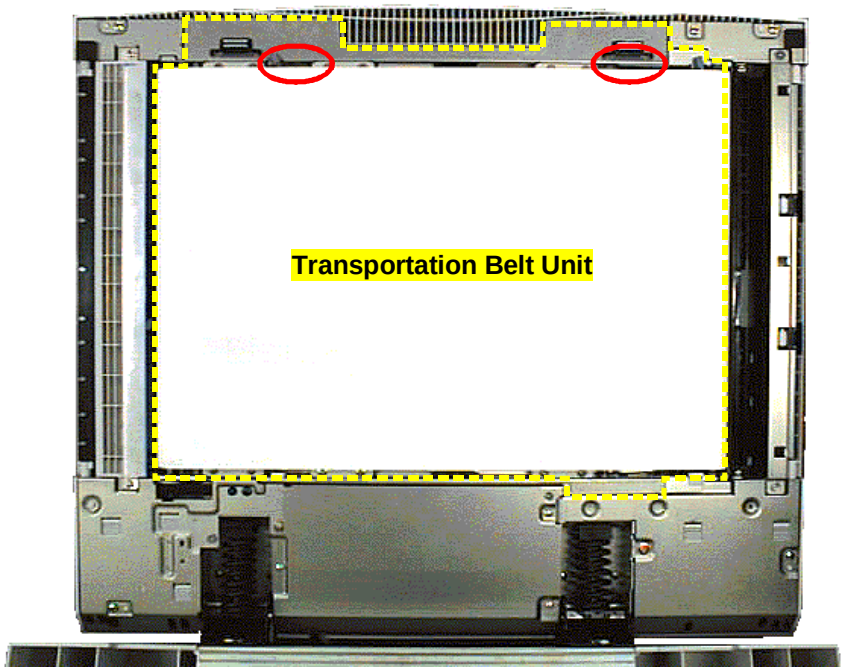


Figure 4-5. Transportation Belt Unit Fixing Position

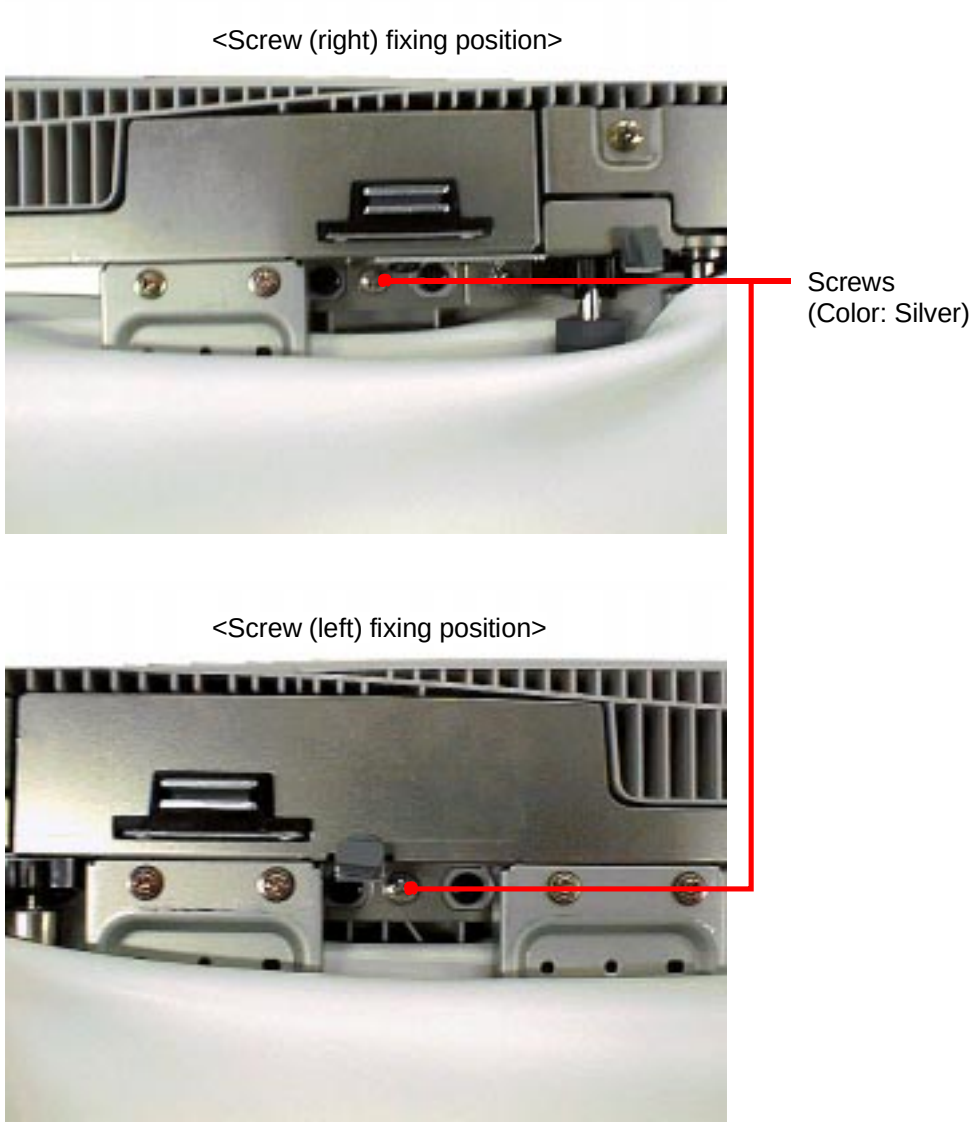


Figure 4-6. Transportation Belt Unit Fixing Screw Removal

4.2.4 Paper Feed Unit Removal

1. Turn the ADF over.
2. Remove 4 screws securing the paper feed unit and 1 screw securing the GND line.
3. Open the access cover located on the paper feed unit side and remove 1 fixing screw indicated in Figure 4-8.
4. Disengage the belt from the pinion gear of the transportation belt drive motor.
5. Disconnect 4 cables for the paper feed unit from the relay connector.
6. Remove the paper feed unit from the housing.

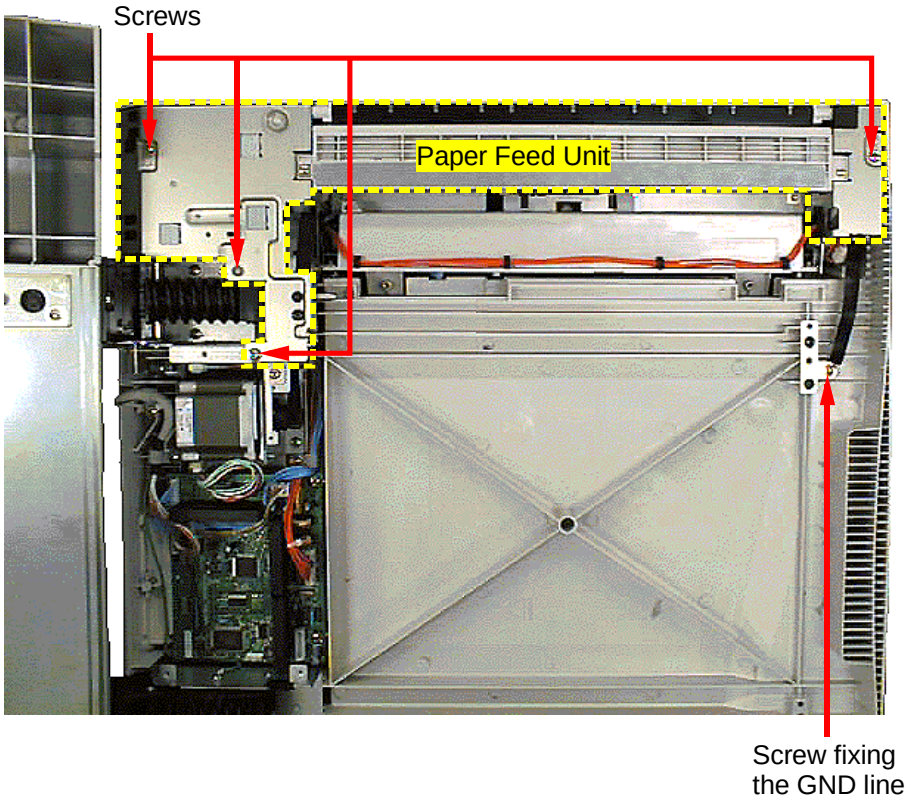


Figure 4-7. Paper Feed Unit Removal (1)

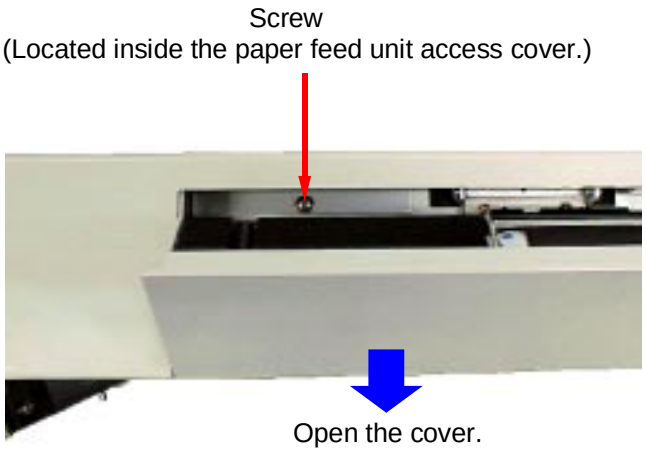


Figure 4-8. Paper Feed Unit Removal (2)

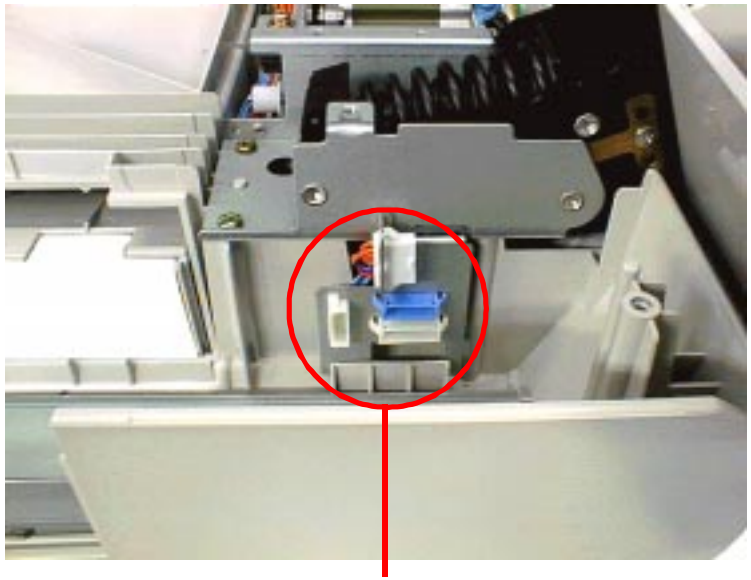


Figure 4-9. Cable Removal

4.2.5 Paper Eject/Reverse Unit Removal

1. Turn the ADF over.
2. Remove 4 screws securing the paper eject/reverse unit and 1 screw securing the GND line.
3. Disconnect 2 cables which connect the paper eject/reverse unit to the connectors on the control board unit.
4. Remove the paper eject/reverse unit from the housing.

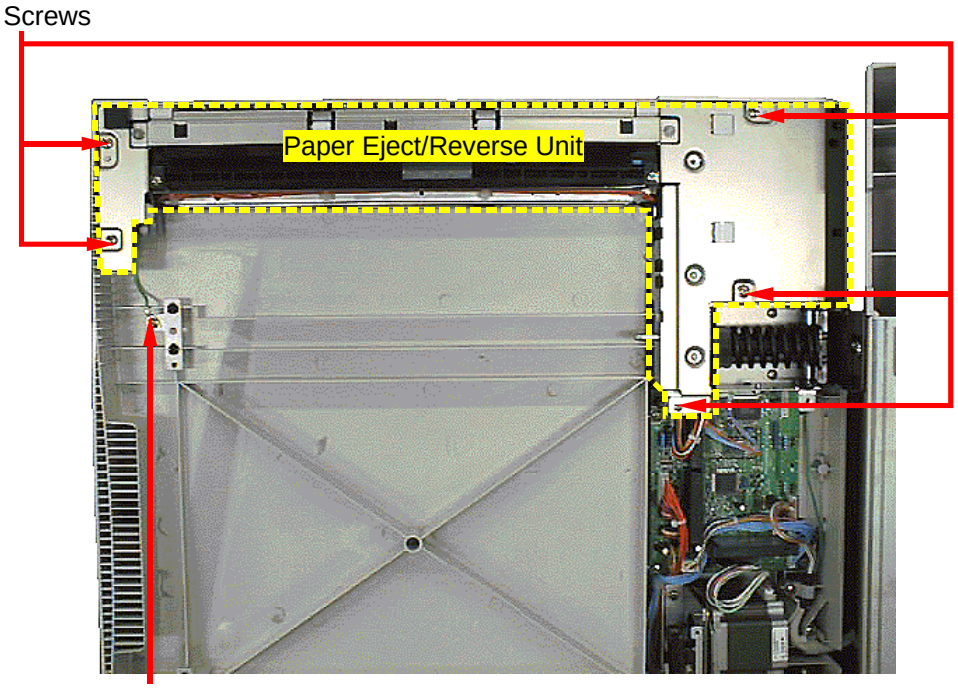


Figure 4-10. Paper Eject/Reverse Removal

4.2.6 Transportation Belt Drive Motor Removal

1. Remove the transportation belt unit. (See Section 4.2.3.)
2. Remove the shield cover. (See Section 4.2.2.)
3. Disengage the belt from the motor pinion gear.
4. Disconnect the cable from the motor, then unhook the tension spring from the tension roller holder plate.
5. Remove 3 screws securing the transportation belt drive motor and remove it.

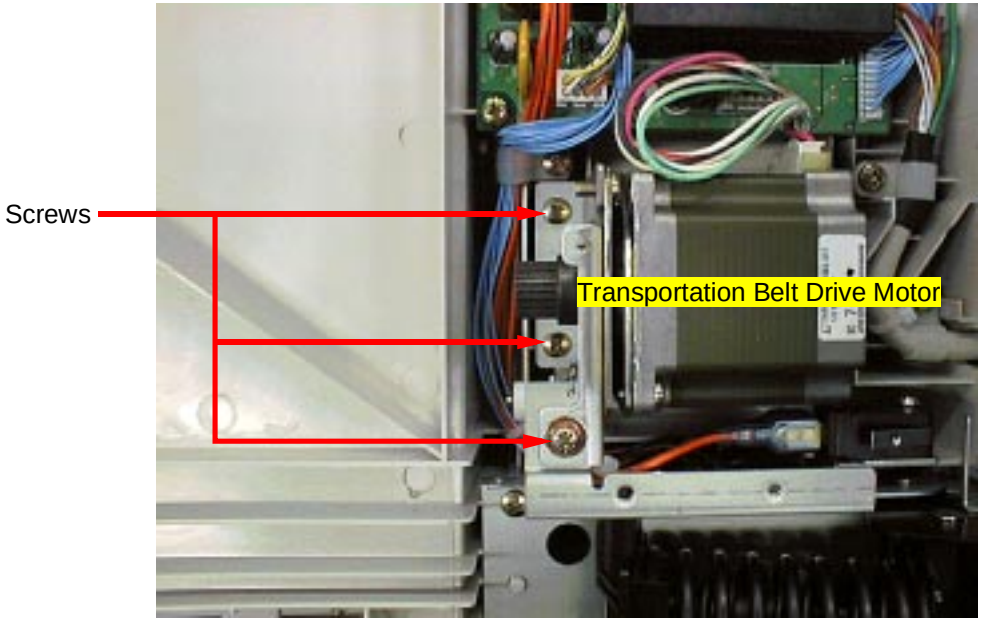


Figure 4-11. Transportation Belt Drive Motor Removal

4.2.7 Paper Feed Motor Unit Removal

This section describes the procedure for removing the paper feed motor in the paper feed unit.

1. Remove the paper feed unit. (See Section 4.2.4.)
2. Loosen the screw and remove the harness cover.
3. Release all cables from the cable hooks attached to the paper feed motor unit.
4. Remove 4 fixing screws and remove the paper feed motor unit.

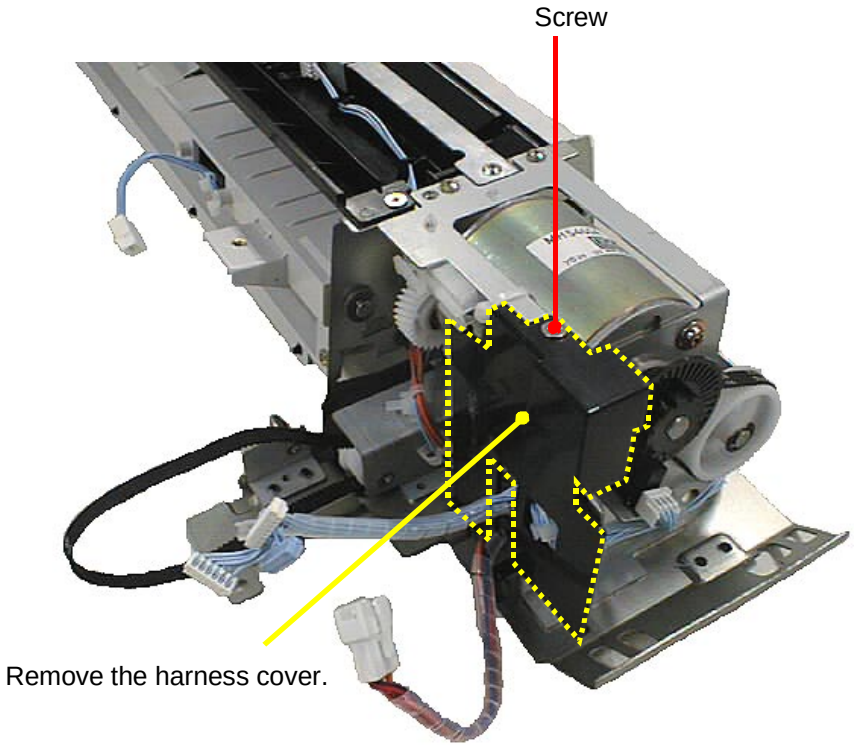


Figure 4-12. Harness Cover Removal

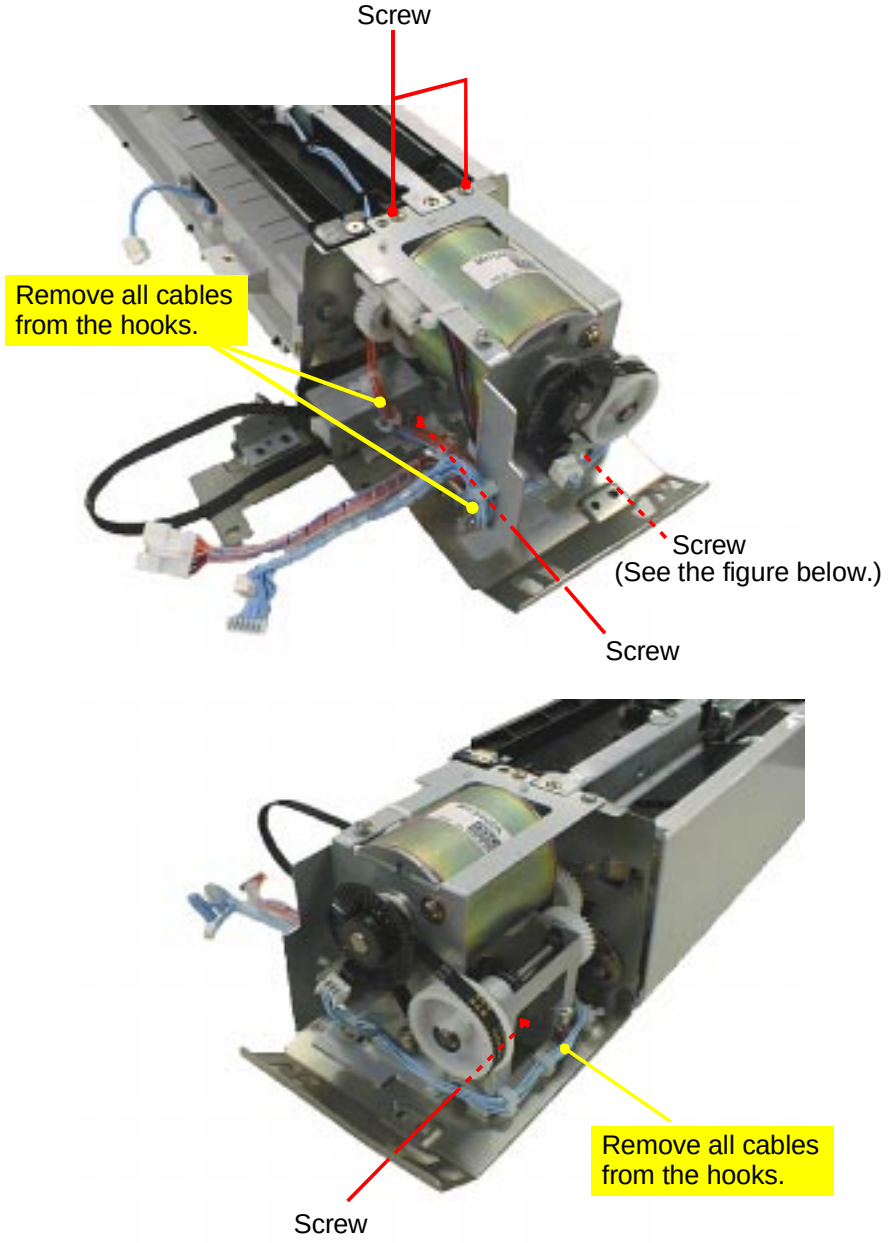


Figure 4-13. Paper Feed Motor Unit Removal

4.2.8 Registration/Timing Sensor Removal

This section describes how to remove the registration sensor and timing sensor in the paper feed unit.

1. Remove the paper feed unit. (See Section 4.2.4.)
2. Remove the paper guide.
   The fixing screws to be removed are:
   - 2 screws: From each of the right and left sides of the paper guide
   - 2 screws: From each of the right and left sides of the paper guide viewed from the top. (Remove them through the holes on the top frame of the paper guide.)
3. Lift up the paper guide to release the cable from the hooks on the paper guide, then remove the paper guide.
4. Remove the fixing screws securing the registration sensor and the timing sensor, and remove the sensors.

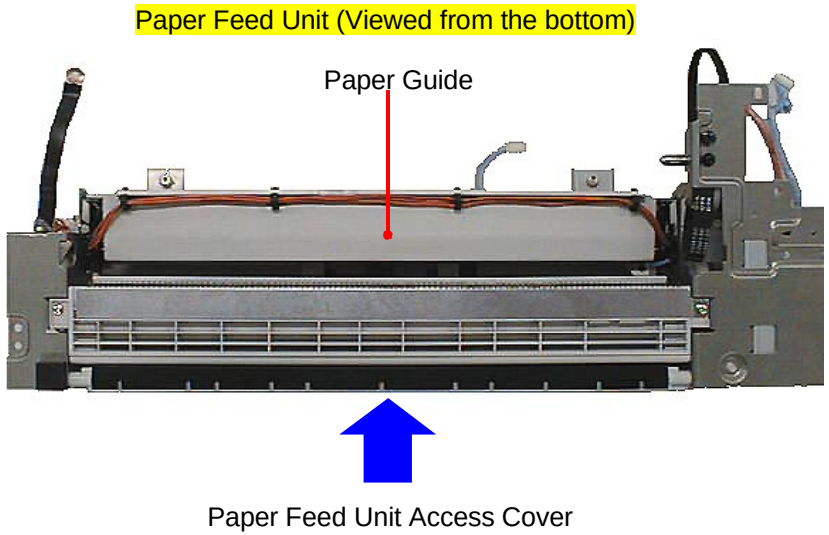


Figure 4-14. Paper Guide Installation Position

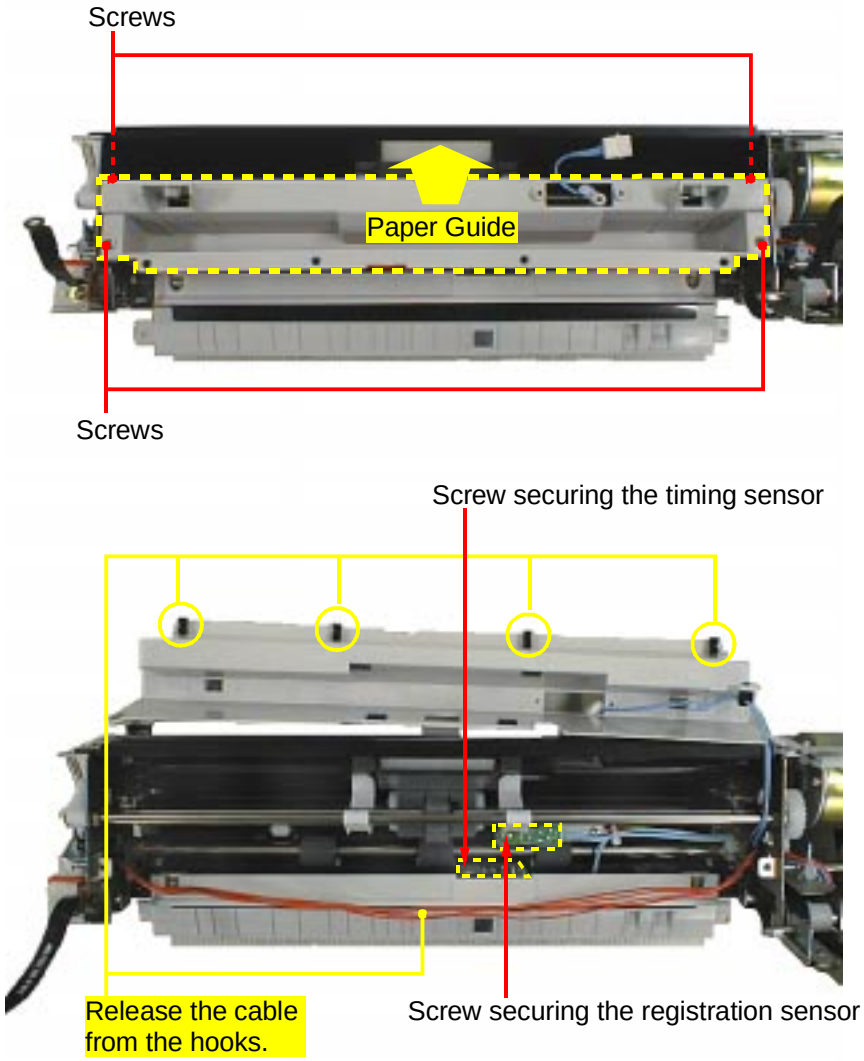


Figure 4-15. Registration/Timing Sensor Removal

4.2.9 Paper Eject/Reverse Motor Unit Removal

This section describes how to remove the paper eject/reverse motor unit from the paper eject/reverse unit.

1. Remove the paper eject/reverse motor unit. (See Section 4.2.5.)
2. Remove 3 screws and remove the paper eject/reverse motor unit.

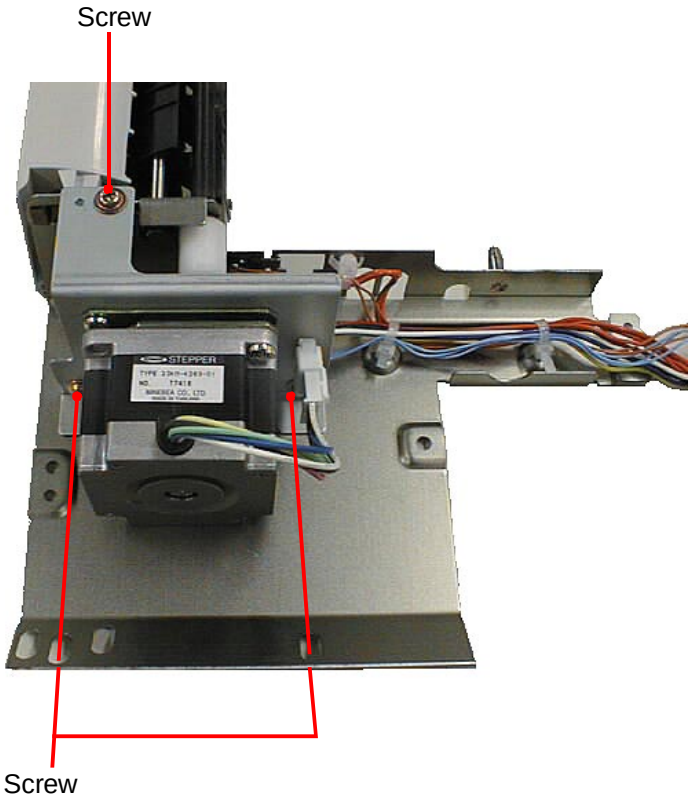


Figure 4-16. Paper Eject/Reverse Motor Unit Removal

4.2.10 Paper Eject Sensor Removal

This section describes how to remove the paper eject sensor in the paper eject/reverse unit.

1. Remove the paper eject/reverse unit. (See Section 4.2.5.)
2. Remove 2 screws at the bottom of the paper eject/reverse unit and remove the paper eject guide.
3. Remove 4 screws, including 2 shoulder screws on the left, and remove the paper guide.
4. Remove 1 fixing screw from the back of the removed paper guide and remove the paper eject sensor.

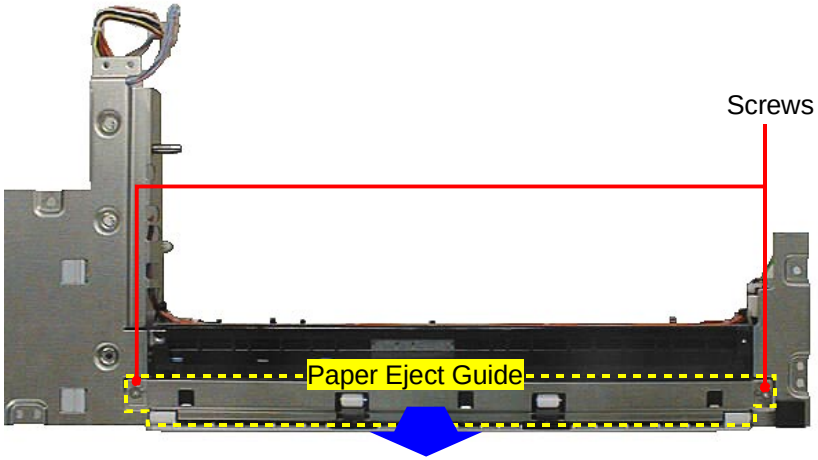


Figure 4-17. Paper Eject Guide Removal

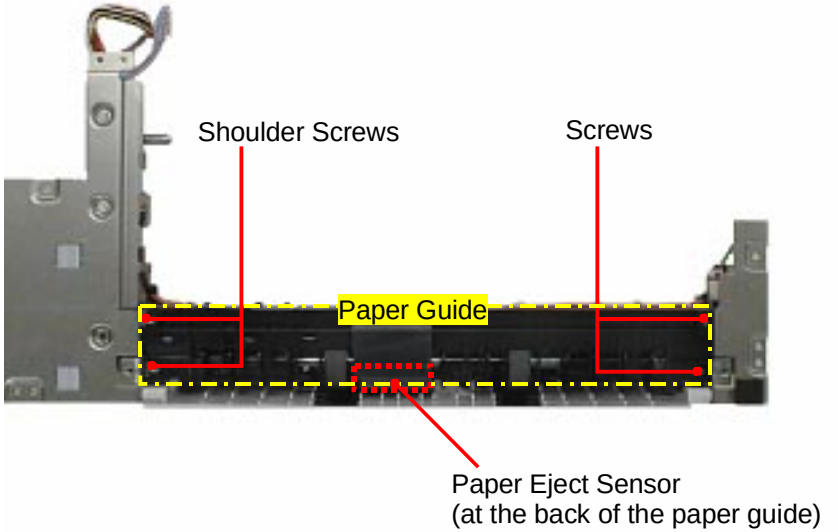


Figure 4-18. Paper Eject Sensor Removal

✓CHECK POINT

2 of the 4 screws securing the paper guide are shoulder screws. Be sure to mount them to the left end of the paper guide.

CHAPTER

5

ADJUSTMENT

5.1 OVERVIEW

This chapter describes adjustments required after disassembling and assembling the ADF or replacing specified parts. Adjustment items of this ADF fall in 2 categories: mechanical adjustment and electrical adjustment.

5.1.1 Adjustment Tools

The tools used for the mechanical and electrical adjustment are described below:

Table 5-1. Tool List

Tool Names	Availability	SE Part No.
Thickness Gauge	Available	B776702201
Tension Gauge	Available	B765114601

The electrical adjustments are made on the built-in program. Therefore, no tool is required.

5.1.2 Mechanical Adjustment

This section describes the mechanical adjustment for the ADF. The table below lists the adjustment items and the corresponding occasions.

Table 5-2. Mechanical Adjustment Items

Adjustment items	Occasions
Flapper solenoid installation position adjustment (Refer to Section 5.1.2.1.)	– Flapper solenoid is removed. – Flapper solenoid is replaced.
Separation plate gap adjustment (Refer to Section 5.1.2.2.)	– Separation plate is removed. – Separation plate is replaced.
Belt tension adjustment (Refer to Section 5.1.2.3.)	– Whole belt roller (left) fixing unit is removed. – The belt is loosened.
Magnet catch installation position adjustment (Refer to Section 5.1.2.4.)	– Magnet catch is removed. – Magnet catch is replaced.
ADF open/close micro switch installation position adjustment (Refer to Section 5.1.2.5.)	– Micro switch is removed. – Micro switch is replaced.
Skew correction adjustment (Refer to Section 5.1.2.6.)	– ADF is removed from the rear case. – Scanned image is skewed. – Fed document jams.

5.1.2.1 Flapper Solenoid Installation Position Adjustment

This adjustment is made to fix the flapper solenoid at the position where proper operation of the flapper is ensured. A flapper is used to reverse/eject the document, and if it is set at an improper position, it may cause malfunctions such as paper jam at ejecting the document and failure in reversing the document. Therefore, be sure to follow the steps exactly as instructed below. You must make this adjustment under the following conditions:

- ❑ Flapper solenoid is removed.
- ❑ Flapper solenoid is replaced.
- ❑ Flapper is replaced.

1. Set the solenoid manually to On condition (induced condition).
2. Keeping the solenoid On, move the whole solenoid backward/forward to make it meet the flapper rubber (*Gap between the flapper and rubber: 0 - 0.5 mm)* and fasten 2 fixing screws to fix the flapper solenoid.
3. Apply some lock-tight to fix the screws.

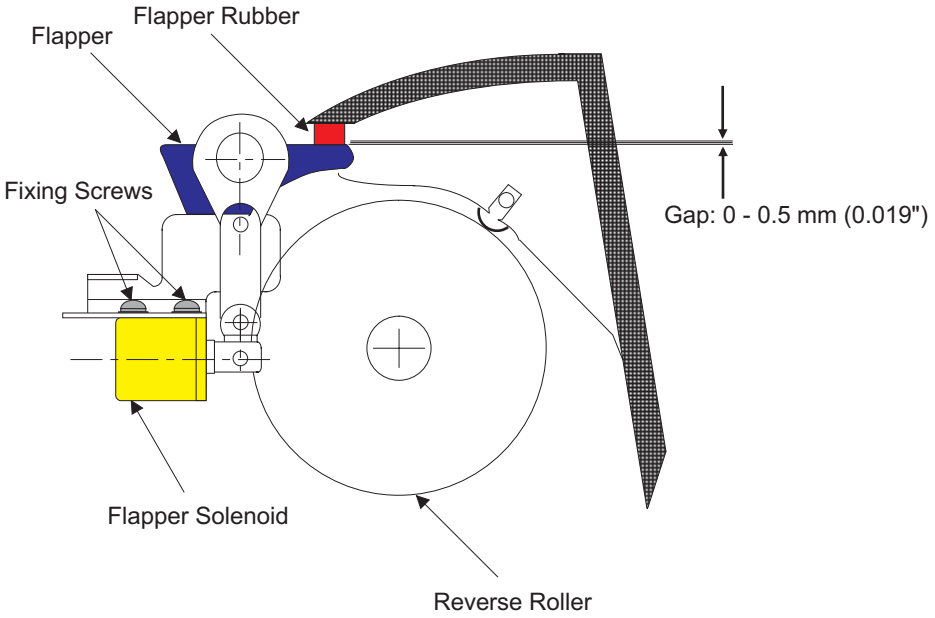


Figure 5-1. Flapper Solenoid Installation Position Adjustment

5.1.2.2 Separation Plate Gap Adjustment

To feed paper one by one from the paper feed tray into ADF in order, the gap between the paper separation plate and paper feed roller must be properly set. Failure in this adjustment may cause jamming or multiple feeding of the document. Make this adjustment under the following conditions:

- ❑ Separation plate is removed.
- ❑ Separation plate is replaced.
- ❑ 2 screws fixing the plate are loosened.
- ❑ PF roller is replaced.

1. Loosen 2 fixing screws securing the separation plate.
2. Insert a thickness gauge between the bottom edge of the separation plate and the PF roller surface. Make sure that the gauge is set at a right angle with the plate.
3. Push the plate down onto the thickness gauge surface and fasten the fixing screws.

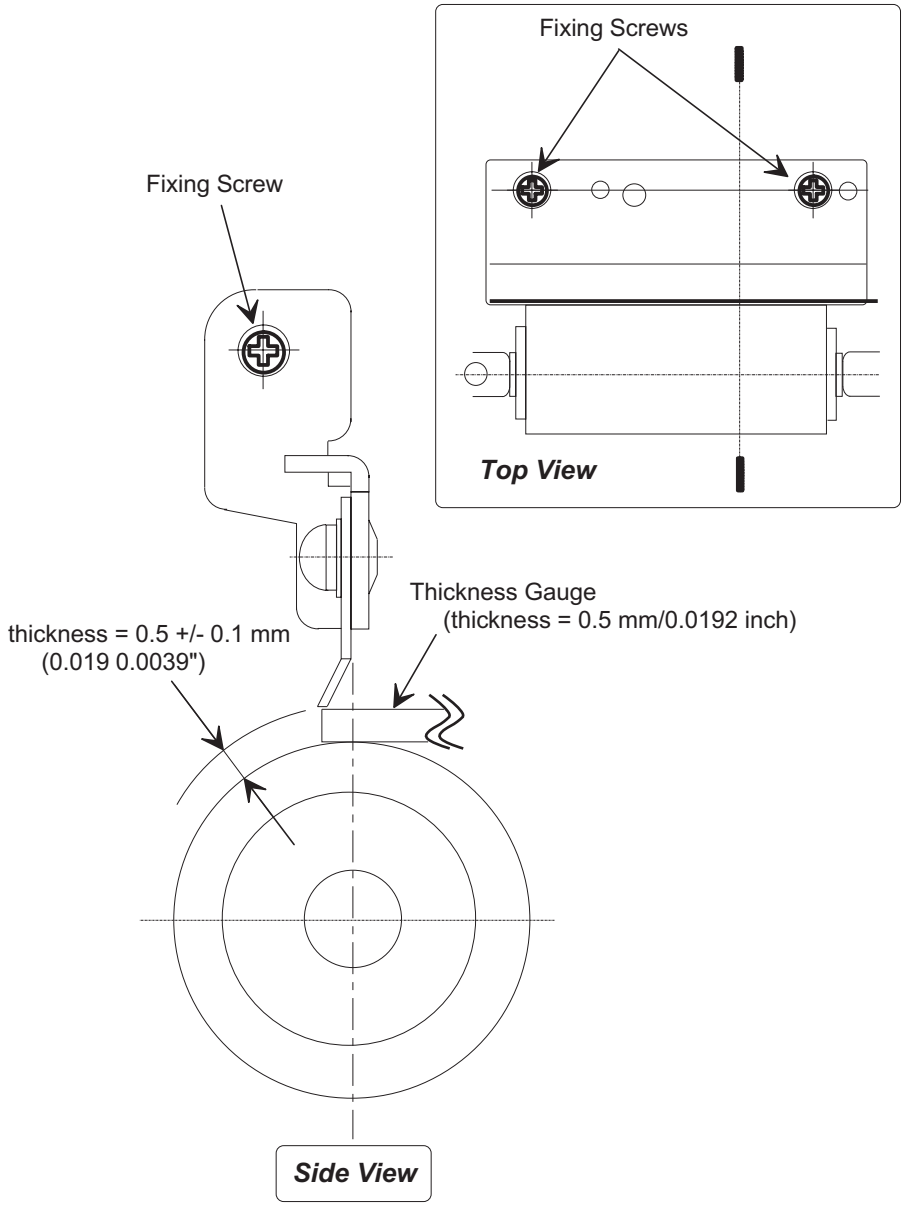


Figure 5-2. Separation Plate Gap Adjustment

5.1.2.3 Belt Tension Adjustment

This adjustment is made to adjust tension of the timing belt used to transmit drive sent from the transportation motor to the transportation belt unit. Failure in this adjustment loses proper play of the belt, and document skew or jam may occur. This adjustment must be made under the following conditions:

- ❑ 2 Screws securing the DF supporting plate are loosened.
- ❑ DF supporting plate is replaced.
- ❑ Belt roller (L) is removed.
- ❑ Belt roller (L) is replaced.

1. With 1 fixing screw on the DF support plate * loosened, push the tension gage to the shoulder screw (M3, 1.4) *[2], then fasten the fixing screw when the gauge indicates 200 g.
   ** Viewed from the front.*

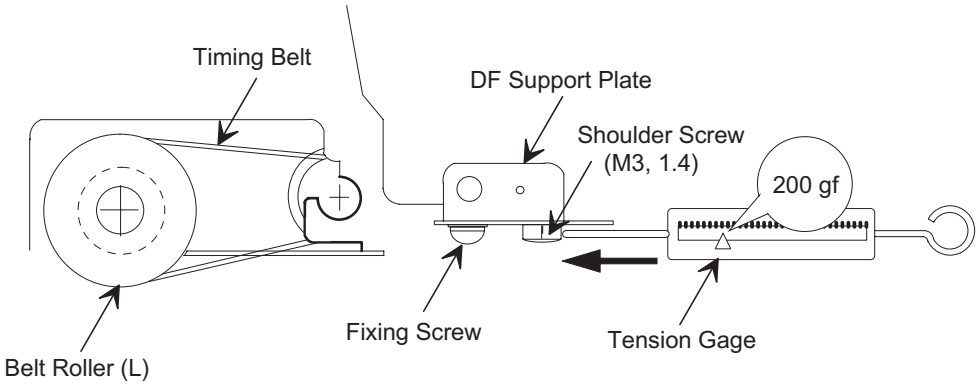


Figure 5-3. Belt Tension Adjustment

5.1.2.4 Magnet Catch Installation Position Adjustment

This adjustment is made to install the magnet catch securely to a proper position after removing or replacing the magnet catch.

1. Install the ADF to the scanner.
2. With the ADF closed, position the magnet catch so that the gap between the platen glass on the scanner and each of 2 spacer rubbers (on the left and right side of the ADF) is 0 - 0.5mm. Then fix the magnet catches with 2 screws.

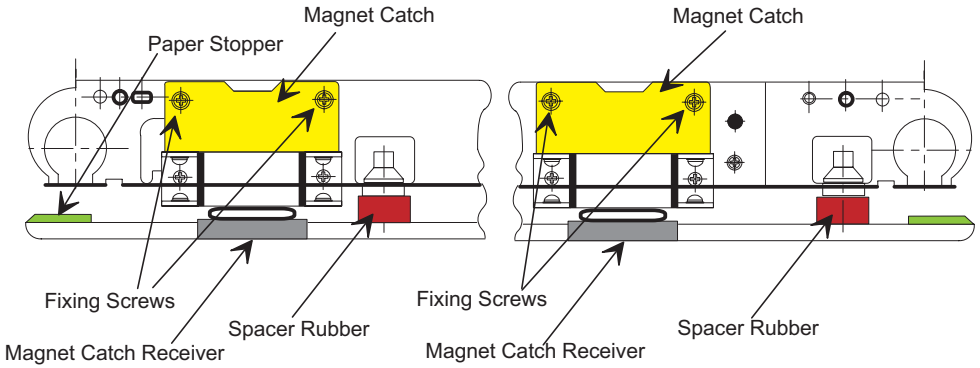


Figure 5-4. Magnet Catch Installation Position Adjustment

5.1.2.5 Micro Switch Installation Position Adjustment

This adjustment is made to adjust the micro switch installation position. With this adjustment, open/close condition of the ADF is correctly detected. At the factory level, the micro switch comes on when the gap between the front edge of the ADF and the document glass of the scanner is 70 mm - 80 mm. Make this adjustment under the following conditions:

- ❑ Micro switch is removed.
- ❑ Micro switch is replaced.
- ❑ DF open switch plate is released.
- ❑ DF open switch is replaced.

1. With 1 fixing screw securing the DF open switch plate loosened, mount the ADF onto the scanner. Then open the ADF fully and start closing gradually .
2. Monitoring the micro switch, shift the DF open switch plate to the position, where the micro switch comes on without fail when the .gap between the front edge of the ADF and the scanner is 70mm.

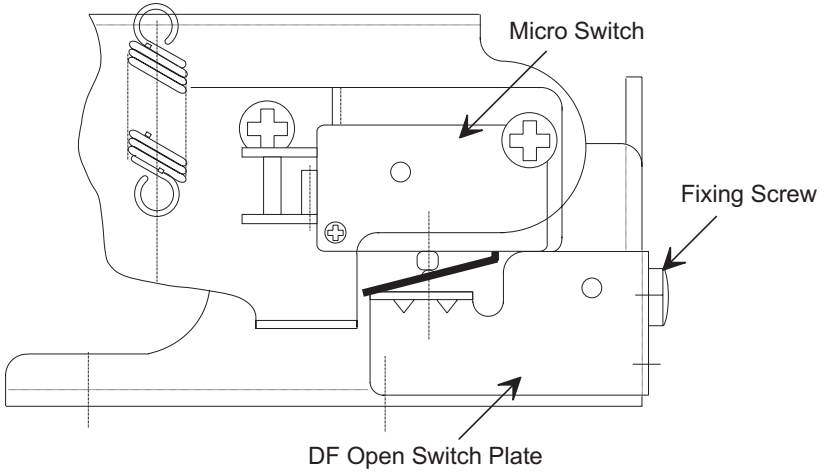
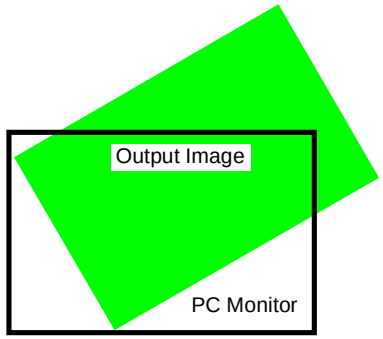


Figure 5-5. ADF Micro Switch Adjustment

5.1.2.6 Skew Correction Adjustment

You must make this adjustment when the output image appears skewed on the PC monitor or ADF is removed from the ADF rear case. To make the adjustment, use the scale on the right hinge base which supports the ADF with the left hinge base. Since the direction for moving the screw varies depending on how the image is skewed, see the skew patterns shown below and perform adjustment properly.

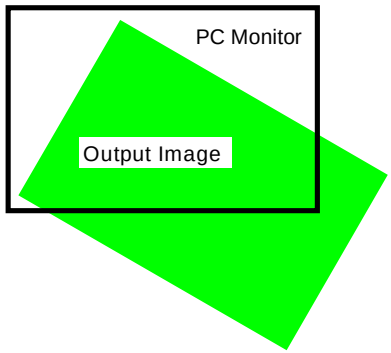
- ❑ If the fed document (output image) is skewed as shown below, loosen the fixing screw in the hinge base (R) and move it toward “B”, then fix it.



Right side upper

- ❑ If the fed document (output image) is skewed as shown below, loosen the fixing screw in the hinge base (R) and move it toward “A”, then fix it.

Right side lower



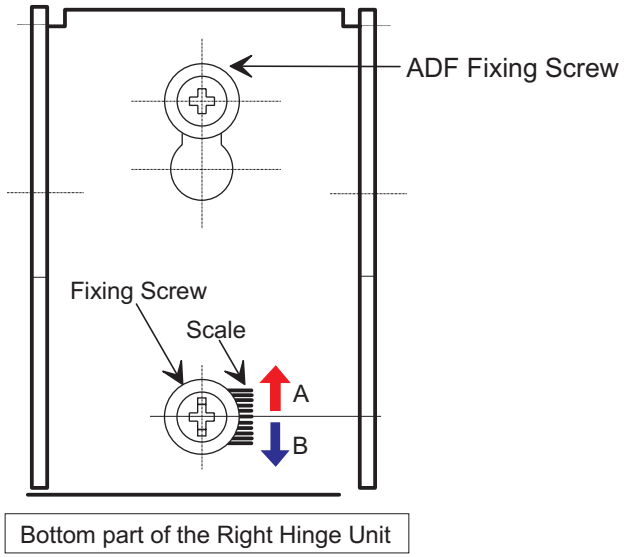


Figure 5-6. Direction for Moving the Screw

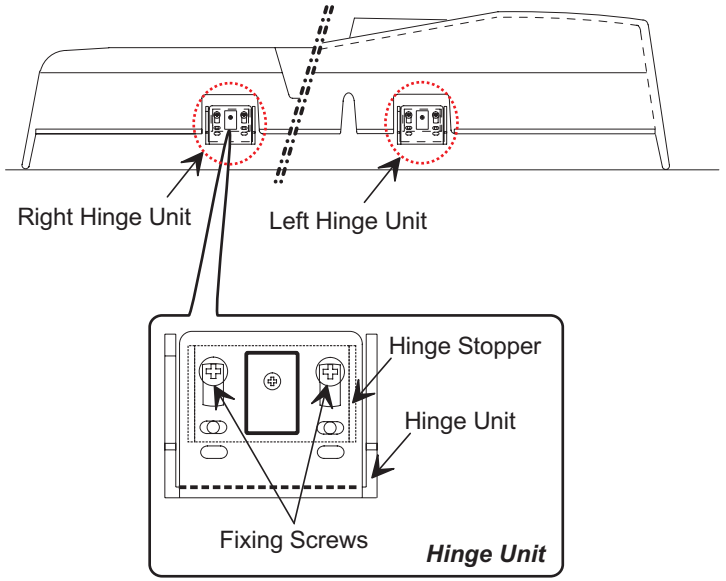


Figure 5-7. Adjusting using the Hinge Base

5.1.3 Electrical Adjustment

This section describes the electrical adjustment for ADF. It consists of 3 adjustment items which must be made after specified actions are taken, as shown in Table 5-3.

Table 5-3. Electrical Adjustment

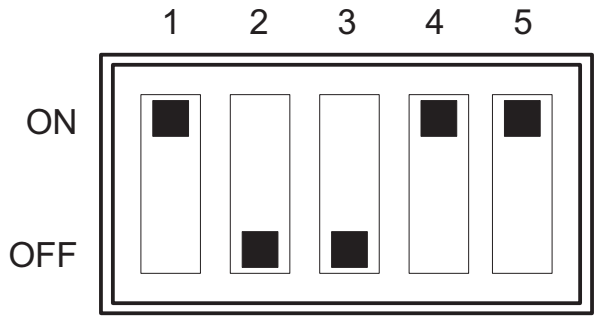
Adjustment Item	Actions taken
Sensor adjustment (Refer to Section 5.1.2.1.)	• The Control board unit is replaced. • Any of the sensors is replaced. • Any of the sensors is cleaned.
EEPROM initialization (Refer to Section 5.1.2.2.)	• The control board is replaced.
Scan stop position adjustment *1 *2 (Refer to Section 5.1.2.3.)	Usually performed by the user. (Set scan stop positions for single and reverse feedings with a increment of 1 mm.)

5.1.3.1 Sensor Adjustment

This ADF is internally equipped with the following 3 photo-interrupter sensors; empty sensor, registration sensor, and reverse sensor.
Since these sensors function by transmitting infrared ray, paper debris and dust built up around the sensors bring change in the voltage level of the signals returned to the CPU, and paper is not detected correctly as a result. Generally, photo-interrupter sensors are inevitably produced with uneven sensitivities. Therefore, the amount of light emitted from the LED must be controlled by the ADF side. This ADF increases LED emission when the voltage level of the signal sent to the CPU drops blow specified level. For this reason, it is essential to provide periodical cleaning to the specified parts as well as to write the highest voltage level, which is electrically unique to each sensor, into the EEPROM under paper empty condition after any of the photo-interrupter sensors is replaced. Without this operation, the ADF continues to refer to the value stored before replacement, and the following may occur as the result:

- ❑ Document is not fed.
- ❑ Document jams near the entrance on the transporting belt.
- ❑ Document jams in the reverse mechanism.

1. Set the ADF to the scanner.
2. Open the switch cover on the ADF and remove 1 screw securing the rotary switch cover, then remove the rotary cover.
3. Set the Dip-switches as shown below.



4. Open and then close either the paper eject cover or the paper feed cover. (The sensor adjustment mode is set with this motion.)
5. Press the push button directly attached to the control board, and the automatic sensor adjustment program starts running to make adjustment and setting for each sensor.

While the program is running, the LED (red) on the control board lights up, and goes off when the adjustment is properly carried out. If the LED indicates an error status as shown in the table below, take any necessary actions.

Table 5-4. LED Status

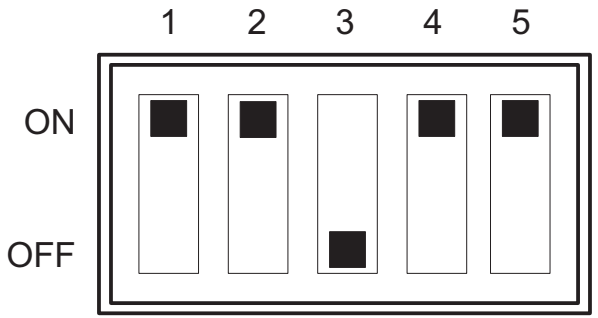
LED indication	Corresponding condition
OFF	The adjustment is properly executed.
ON	EEPROM initialization has failed. (Refer to Section 4.1.2.2.)
Blinks (Interval: 1000 ms)	Registration sensor is defective.
Blinks (Interval: 500 ms)	Timing sensor is defective.
Blinks (Interval: 50 ms)	Reverse sensor is defective.

⚠CAUTION ***The factory setting for the Dip-switches are all OFF. Therefore, set all the switches back to Off after adjustment.***

5.1.3.2 EEPROM Initialize and Sensor Adjustment

This adjustment must be made after the control board unit is replaced. The EEPROM on the control board stores values for sensor sensitivity and scan stop position. Therefore, whenever you replace the control board, you must perform EEPROM initialization, which is followed by the sensor adjustment consecutively.

1. Set the ADF on the scanner.
2. Open the switch cover on the ADF and remove 1 screw securing the rotary switch cover. Then remove the rotary switch cover.
3. Set the Dip-switches as shown below.



4. Open and then close either the paper eject cover or the paper feed cover. (The EEPROM initialization and sensor adjustment mode is set with this motion.)
5. Press the push button directly attached to the control board to run the adjustment program, and EEPROM initialization and the sensor adjustment for each sensor are carried out.

5.1.3.3 Scan Stop Position Adjustment

This adjustment must be made to adjust the scanning position after the document is transported into the ADF. It is performed by turning the rotary switch located under the switch cover at the top of the ADF.
This adjustment, a user performable adjustment, must be separately made for the single feeding and reverse feeding. The table below shows the rotary switch settings and corresponding amount shifted.

Table 5-5. Switch Setting and Corresponding Shifting Length

Rotary Switch Setting	Amount shifted (mm)
0	0 (Reference position)
(+) value	1mm / step
(-) value	1mm / step

✓CHECK POINT

Adjustment for the single and reverse feedings are made as follows:
[Single feeding] Made by controlling the rotational number of the reverse motor after paper empty condition is detected by the timing sensor.
[Reverse feeding] Made after paper empty condition is detected by the reverse sensor

CHAPTER

6

MAINTENANCE

6.1 OVERVIEW

Maintaining of this ADF includes the following 3 items: cleaning, lubrication and adhesion. This chapter provides information on the lubricants and adhesives used for maintaining this ADF.

⚠CAUTION

- ***Never apply thinner, trichloroethylene, or ketone-based solvents, since these substances may cause plastic or rubber parts to deform or degenerate.***
- ***Use lubricant or adhesive which are recommended for this printer. Otherwise, nearby parts may be damaged.***

✓CHECK POINT

This ADF requires cleaning when it has fed 40,000 documents in total. Therefore, be sure to check the total number of the fed documents and perform any necessary cleaning on occasion such as repair or periodic maintenance service. (Refer to Section 6.1.1.)

Table 6-1. Lubricants and Adhesives

Name	Availability	Part code
Grease (EM-50L)	EPSON-Exclusive	TBD
Lock-tight (#2)	EPSON-Exclusive	B730200200

6.1.1 Cleaning

This ADF requires cleaning when the total number of fed documents is 40,000. The cleaning items are listed in the table below. However, the total fed number does not always determine the exact time for cleaning. Therefore, whenever you find the abnormal operations such as a failure in feeding or transporting paper and paper jam, clean any relevant parts which brought the problem.

Table 6-2. Cleaning Items

Parts to be cleaned	Description
Pickup roller	Wipe off the paper debris and dust with a moistened cloth squeezed tightly.
Paper feed roller	
Separation roller	
Transportation belt	
Registration roller	
Paper eject/Reverse roller	
Paper eject roller	
Registration sensor	Wipe off the paper debris and dust with cotton swabs.
Timing sensor *	
Paper eject/Reverse sensor *	

Note: *Remove the cover before cleaning the timing sensor and the paper eject/reverse sensor,*

6.1.1.1 Cleaning Points

Pickup Roller

The pickup roller, a half-moon-shape roller with a toothed side on it, is located in the bottom part of the paper feed tray. Turn the roller manually and clean it with a cloth moistened with alcohol or water.

Figure 6-1. Pickup Roller Location

Paper Feed Roller, Separation Roller, Registration Roller and Registration Sensor

Open the paper feed cover and clean the PF roller, separation roller, registration roller and registration sensor.

✓CHECK POINT

Use cotton swabs to reach the narrow corners when cleaning the registration sensor and reflection plate.

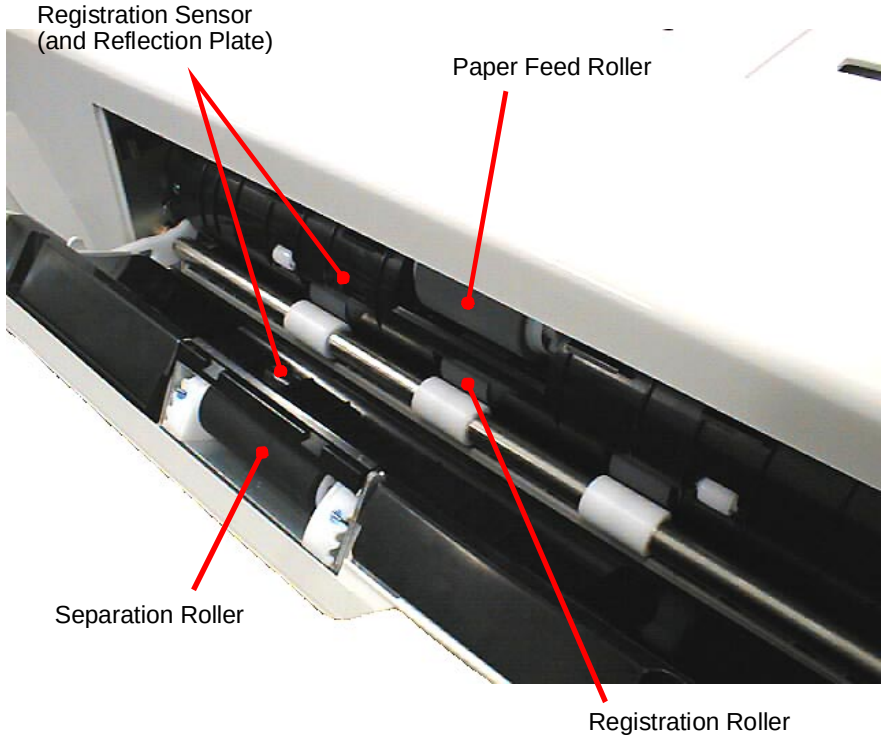


Figure 6-2. Rollers and Registration Sensor

Transportation Belt

With the ADF fully open, clean the belt by turning it manually.

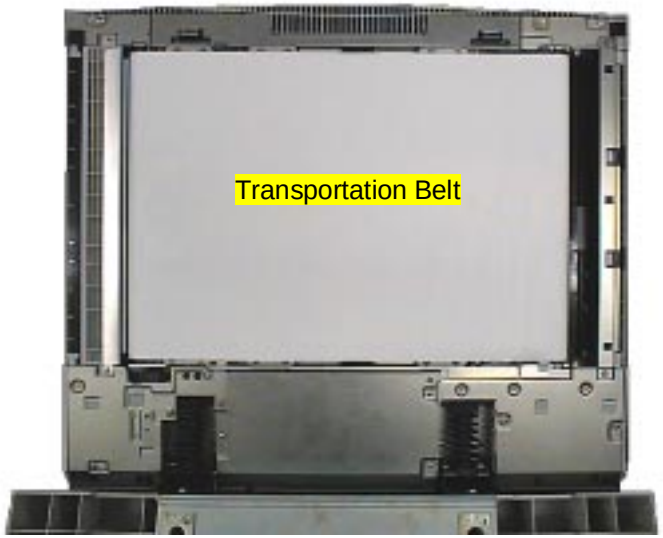


Figure 6-3. Transportation Belt Cleaning

Reverse Roller

2 reverse rollers are located under the paper eject cover. Clean the rollers by turning them manually.

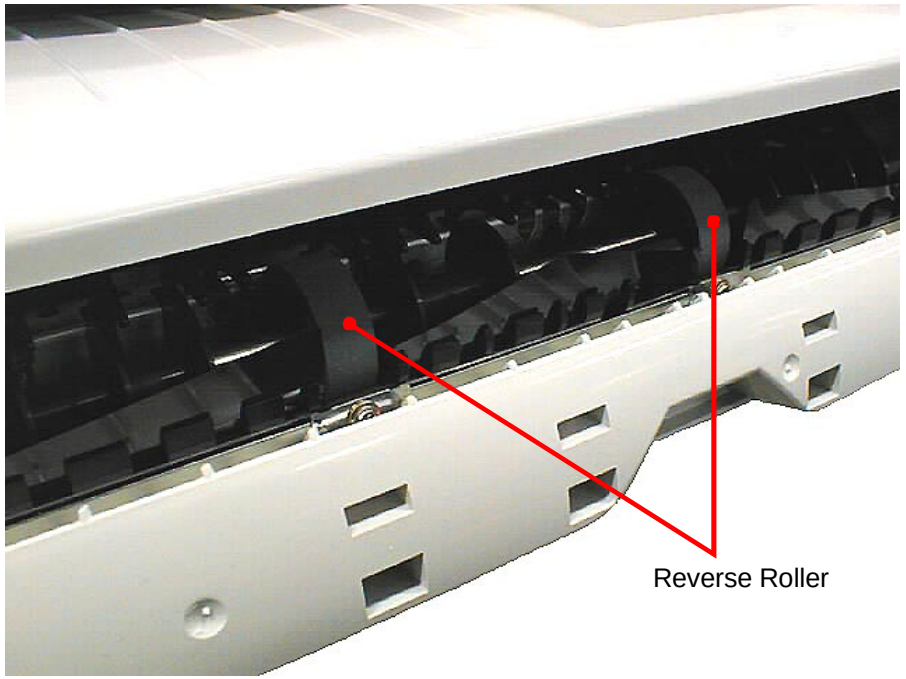


Figure 6-4. Reverse Roller Cleaning

Paper Eject Roller

2 paper eject rollers are located near the slot where document is ejected. Clean the rollers by turning them manually.

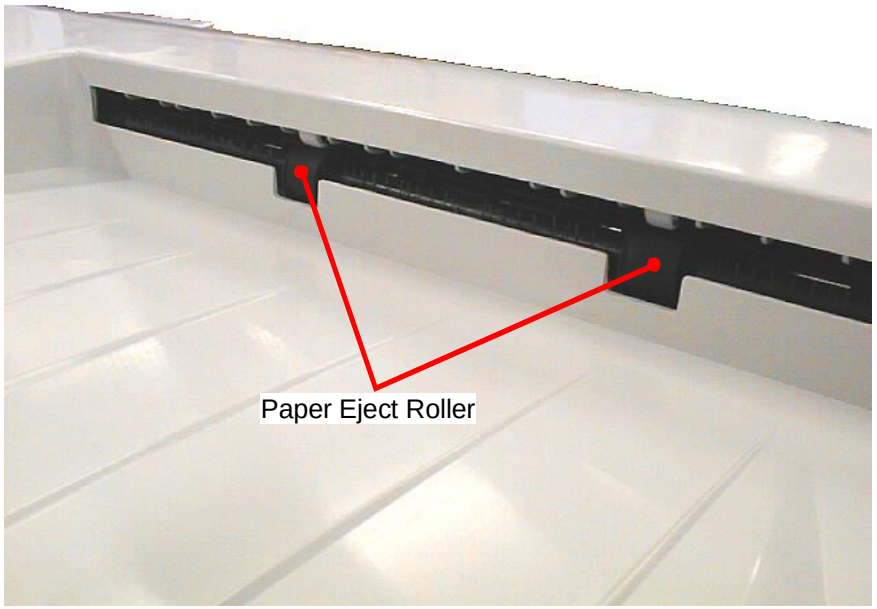


Figure 6-5. Paper Eject Roller

Timing Sensor

With the ADF open, remove 2 screws securing the registration guide on the left. Then clean the timing sensor.

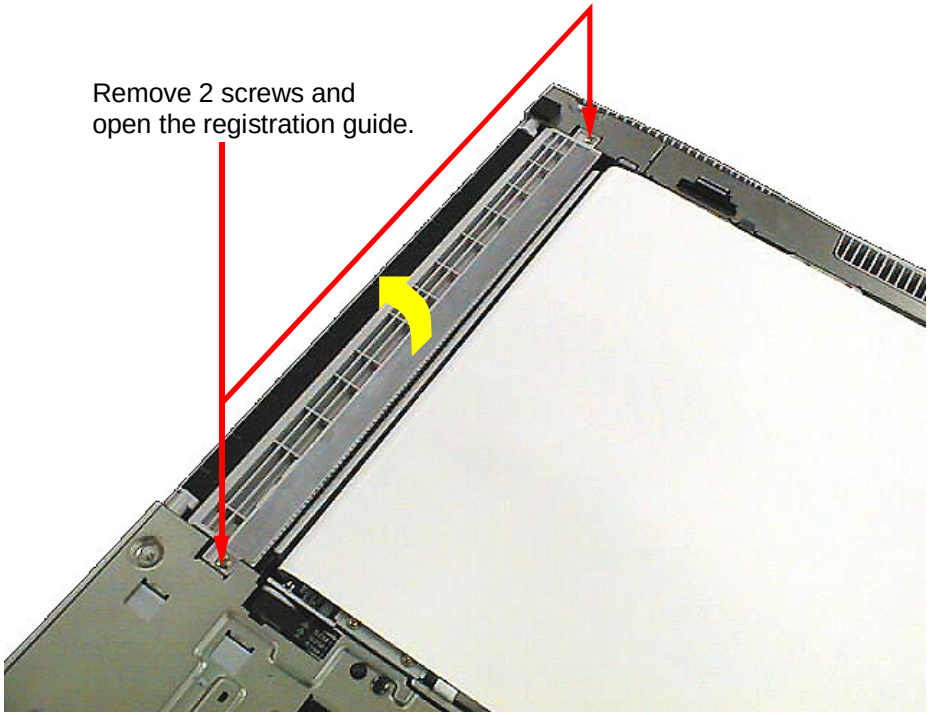


Figure 6-6. Releasing the Registration Guide

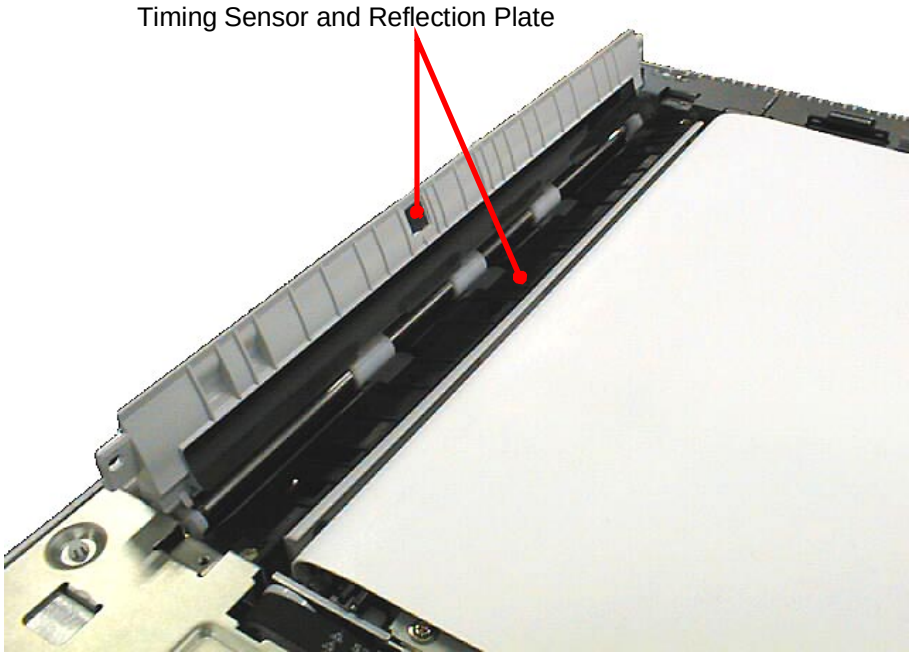


Figure 6-7. Timing Sensor

Paper Eject/Reverse Sensor

With the ADF open, remove 2 screws securing the reverse guide on the right. Then clean the reverse sensor.

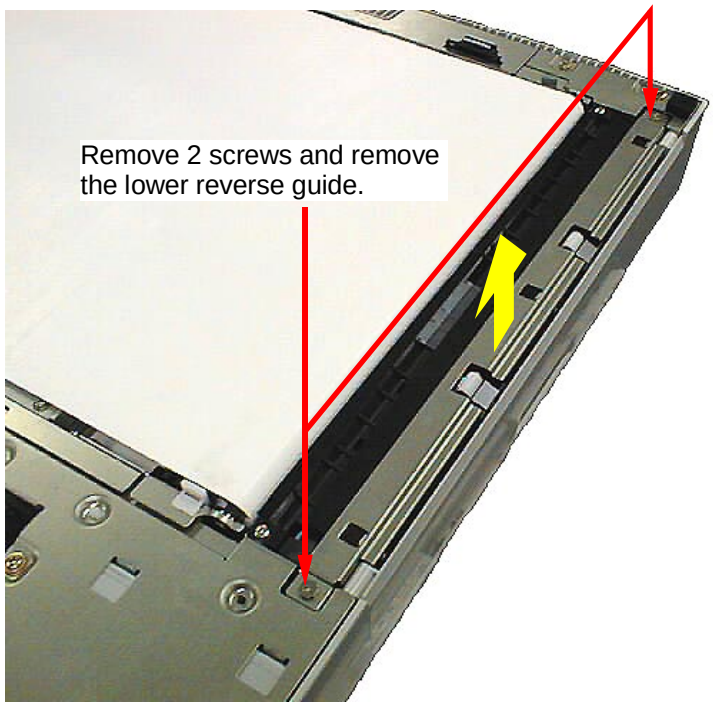


Figure 6-8. Paper Eject/Reverse Sensor

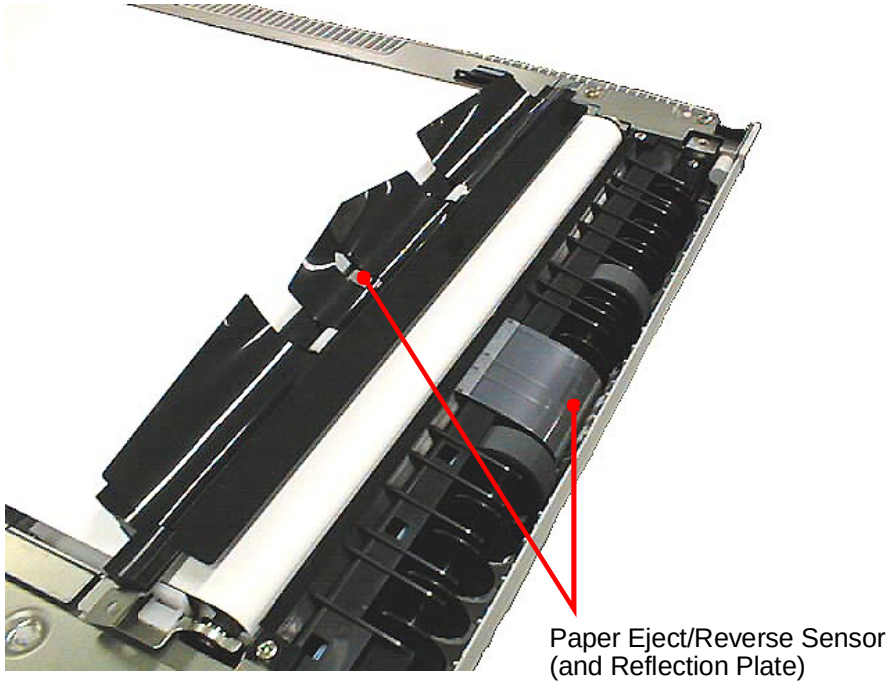


Figure 6-9. Paper Eject/Reverse Sensor

6.1.2 Lubrication

This section gives information on where to lubricate in the ADF.

⚠WARNING ***Use only the lubricant specified for this ADF, since use of other lubricants may damage nearby parts. The lubricant specified is TBD.***

Lubricating Point (1)

Points:
- ❑ Cutouts in the registration links which slide along the shoulder screws (M3, 3.3)
- ❑ Locking leaf springs (Colored areas in Figure 6-10)

Amount:
- ❑ Cutouts in the links: 30 mg each
- ❑ Locking leaf springs: 10 mg each

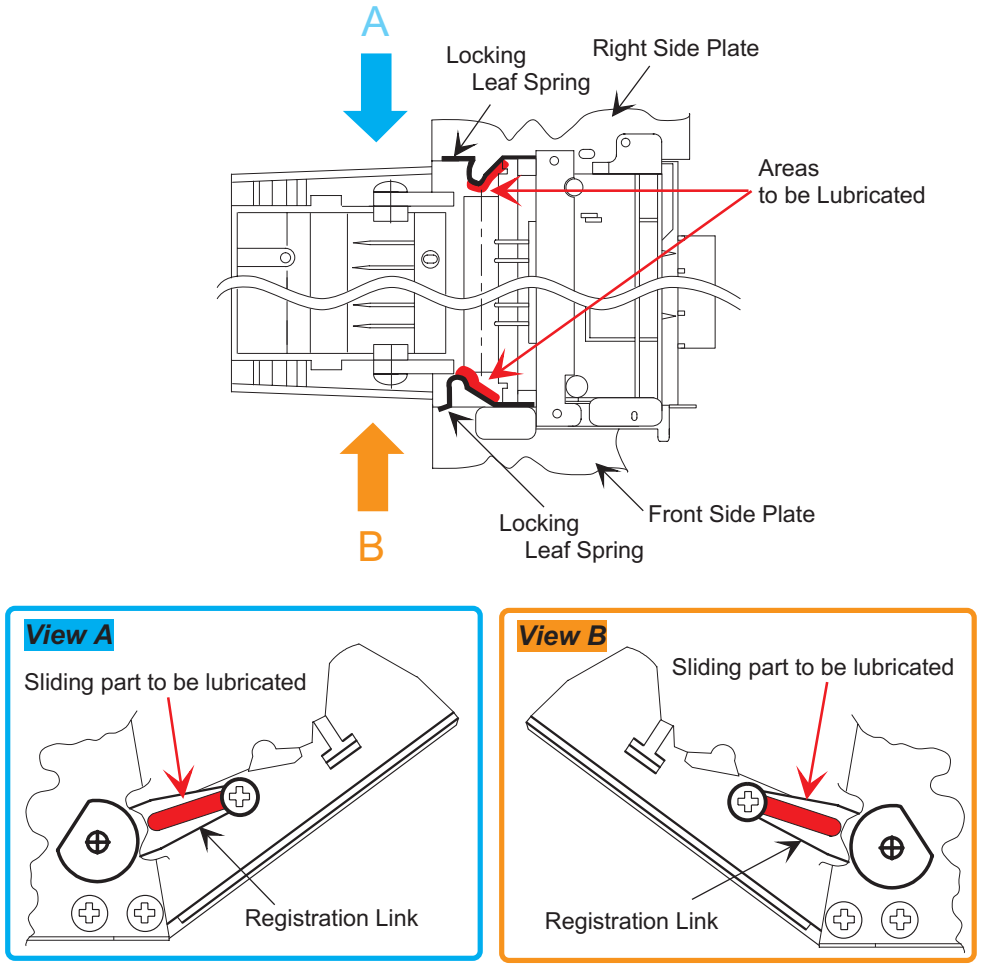


Figure 6-10. Lubricating Point (1)

Lubricating Point (2)

Points:
- ❑ Sliding part for the bushing and the pulley roller holder
- ❑ Sliding part for the slide shaft bushing and the pulley holder

Amount: 10 mg each

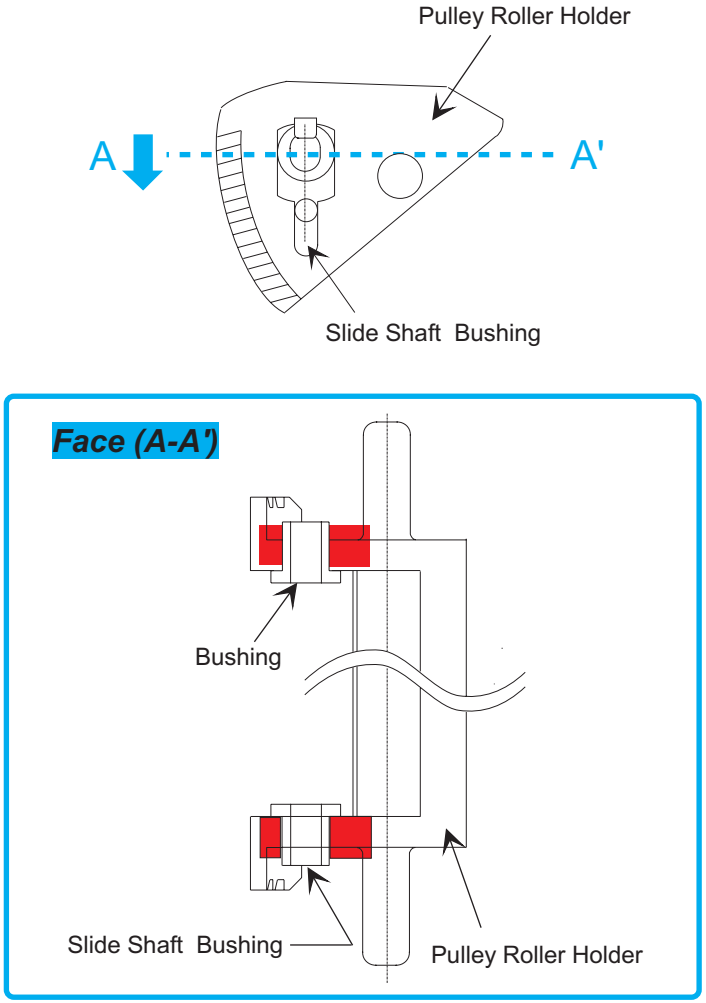


Figure 6-11. Lubricating Point (2)

Lubricating Point (3)

Points: Sliding parts in the dropping roller holders (Colored areas in Figure 6-12)

Amount: 5 mg each

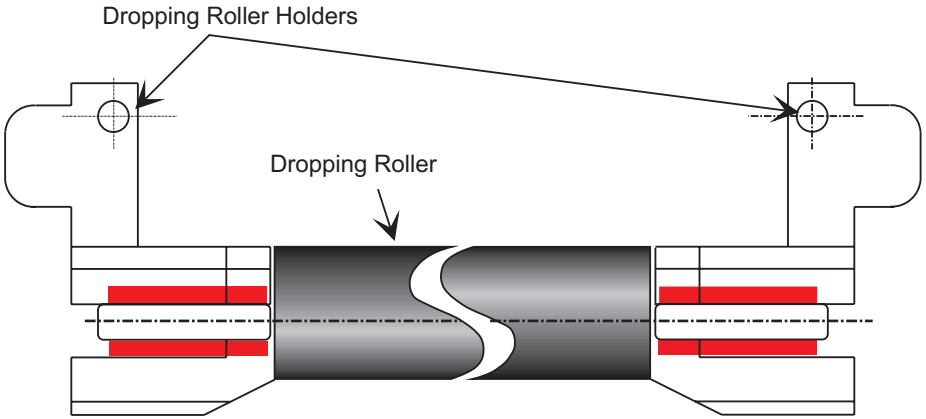


Figure 6-12. Lubricating Point (3)

Lubricating Point (4)

Points: Sliding parts in the leaf spring for the holding roller (Colored areas in Figure 6-13)

Amount: 5 mg each

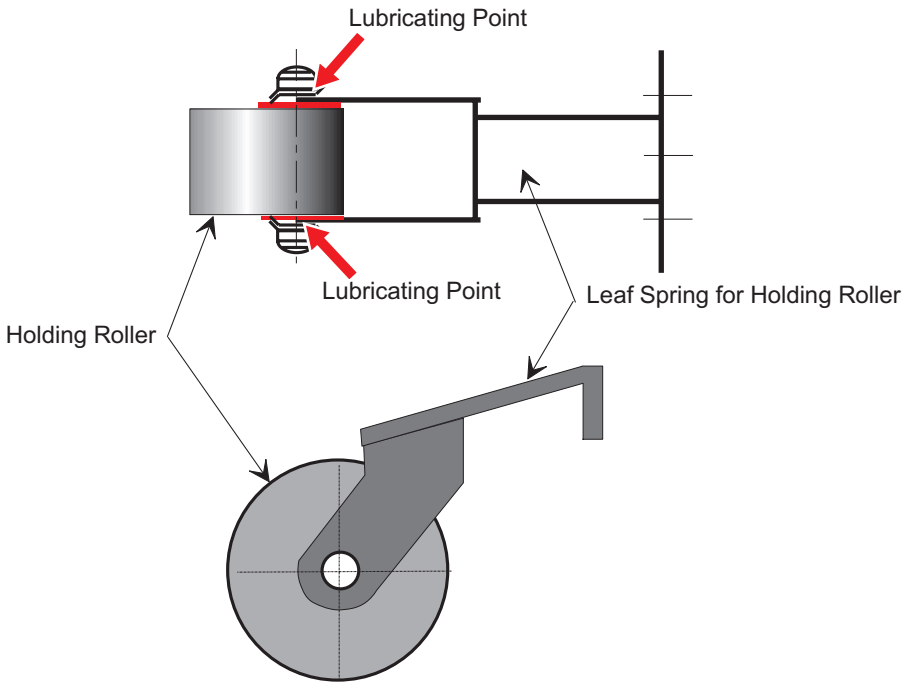


Figure 6-13. Lubricating Point (4)

Lubricating Point (5)

Points: Sliding parts for the belt holders and the belt holding roller (2). (Colored areas in Figure 6-14)

Amount: 5 mg each

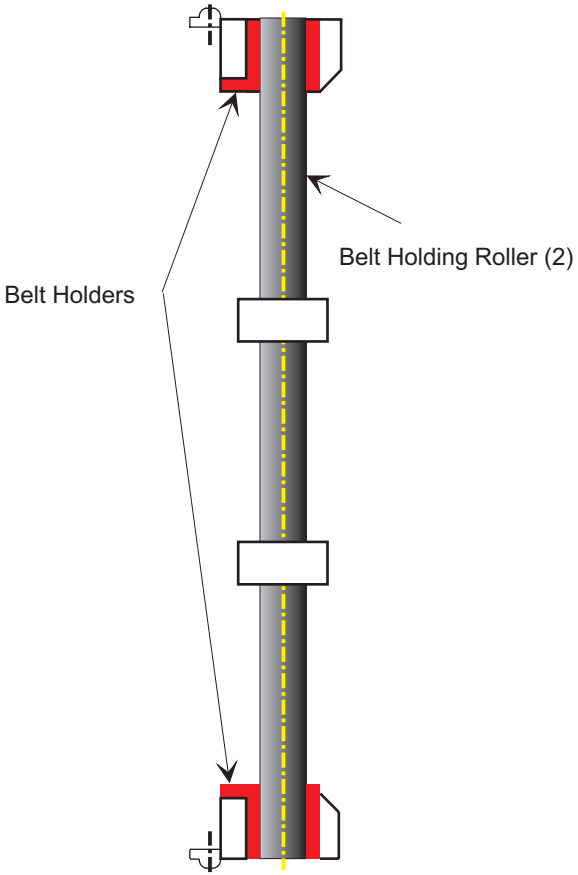


Figure 6-14. Lubricating Point (5)

Lubricating Point (6)

Points: Sliding parts for the belt holders and belt holding roller K-S (Colored areas in Figure 6-15)

Amount: 5 mg each

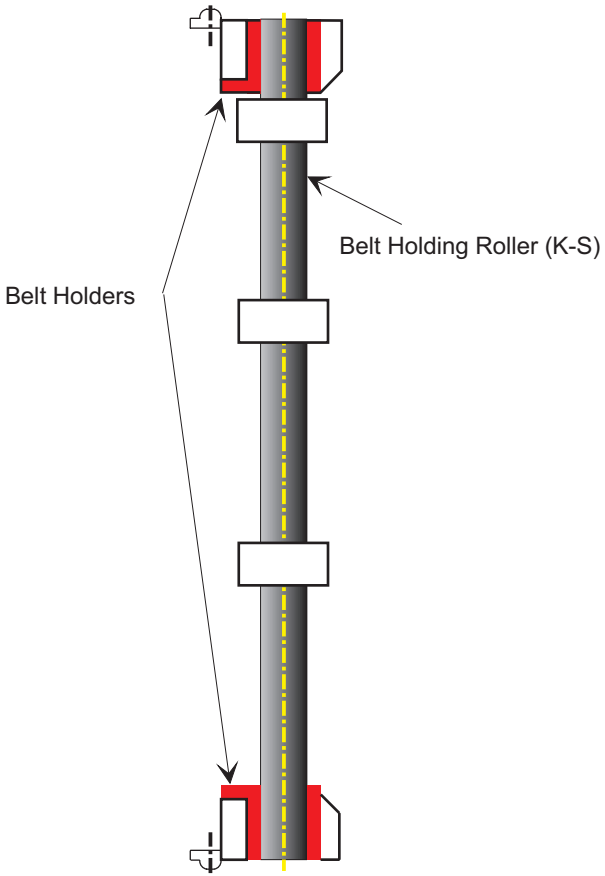


Figure 6-15. Lubricating Point (6)

Lubricating Point (7)

Points: Sliding part for the DF support shaft and right DF side plate. (Colored area in Figure 6-16)

Amount: 10 mg each

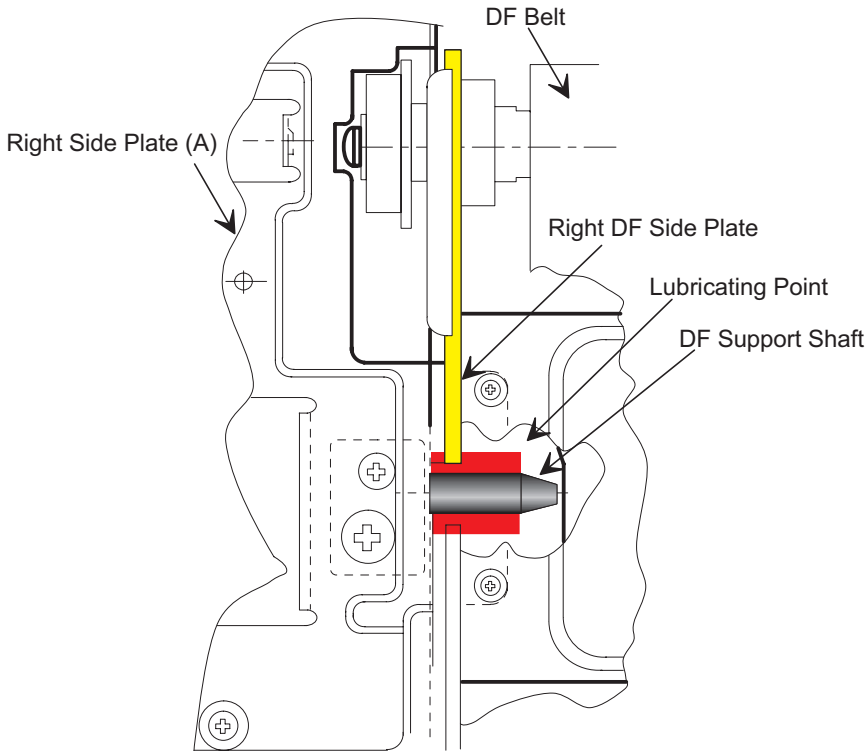


Figure 6-16. Lubricating Point (7)

Lubricating Point (8)

Points: Tension shaft surface around which the right tension roller turns

Amount: 5 mg

Note: *Do not lubricate the external surface of the right tension roller.*

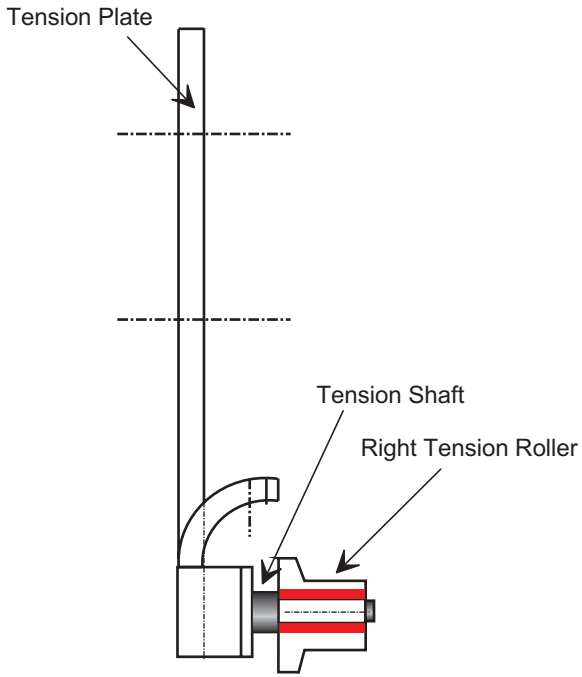


Figure 6-17. Lubricating Point (8)

Lubricating Point (9)

Points: Contact Points for the eject roller and eject leaf spring (Colored points in Figure 6-18)

Amount: 5 mg each

Note: *Do not lubricate the external surface of the eject roller.*

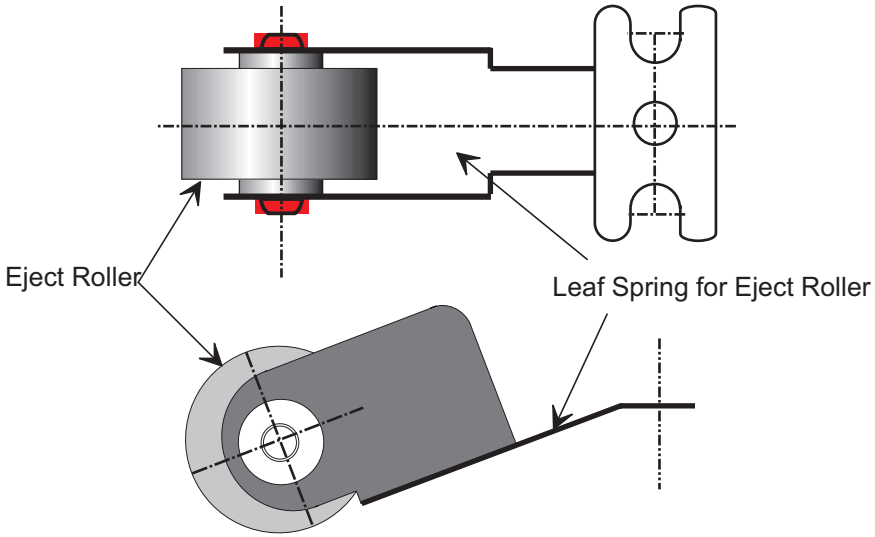


Figure 6-18. Lubricating Point (9)

Lubricating Point (10)

Points: Sliding part of the reverse roller shaft
(Colored area in Figure 6-19)

Amount: 5 mg each

Note: *Do not lubricate the external surface of the reverse roller.*

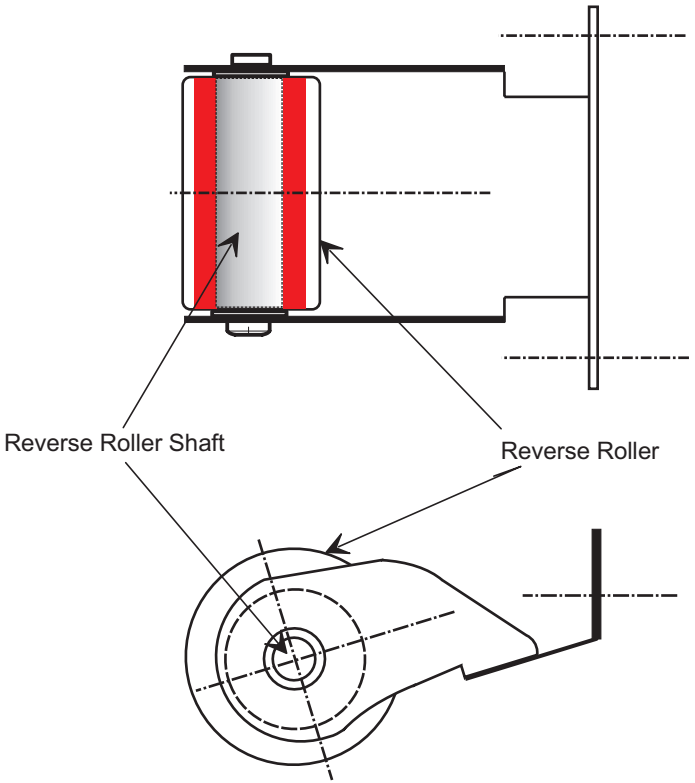


Figure 6-19. Lubricating Point (10)

Lubricating Point (11)

Points: Sliding parts of the reverse roller shafts (U)
(Colored areas in Figure 6-20)

Amount: 5 mg each

Note: *Do not lubricate the external surface of the reverse roller.*

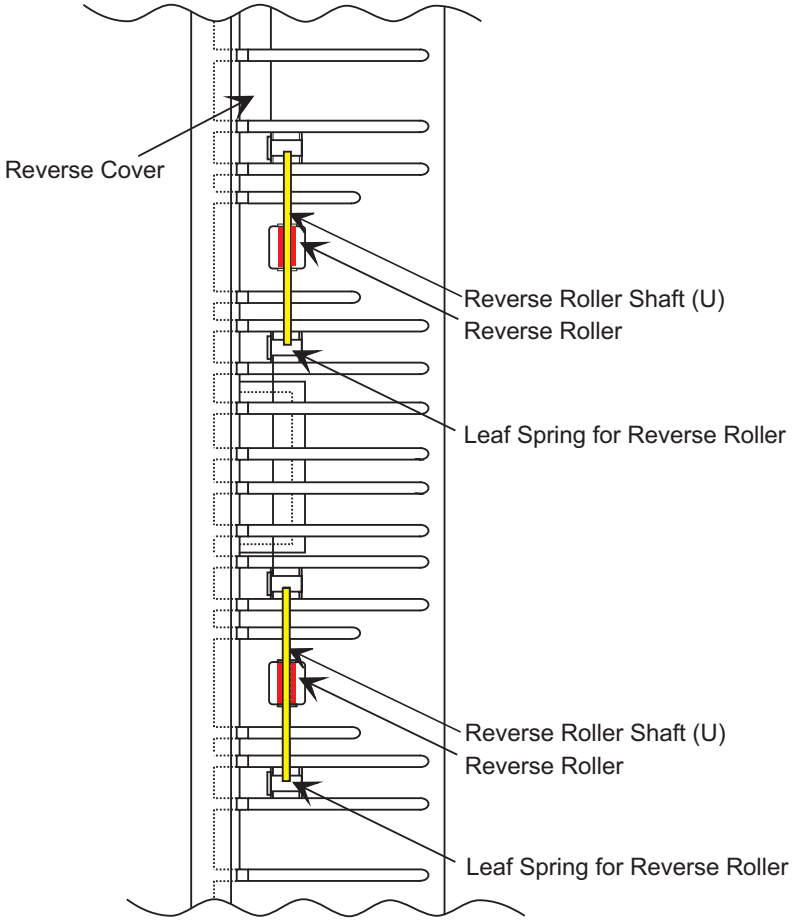


Figure 6-20. Lubricating Point (11)

Lubricating Point (12)

Points:
- ❑ Sliding parts for the flapper shaft and front and rear reverse side plates. (Colored areas in Figure 6-21)
- ❑ Colored areas of the key locks
  (Wipe off the lubricant with a cloth after applying.)

Amount: 10 mg each

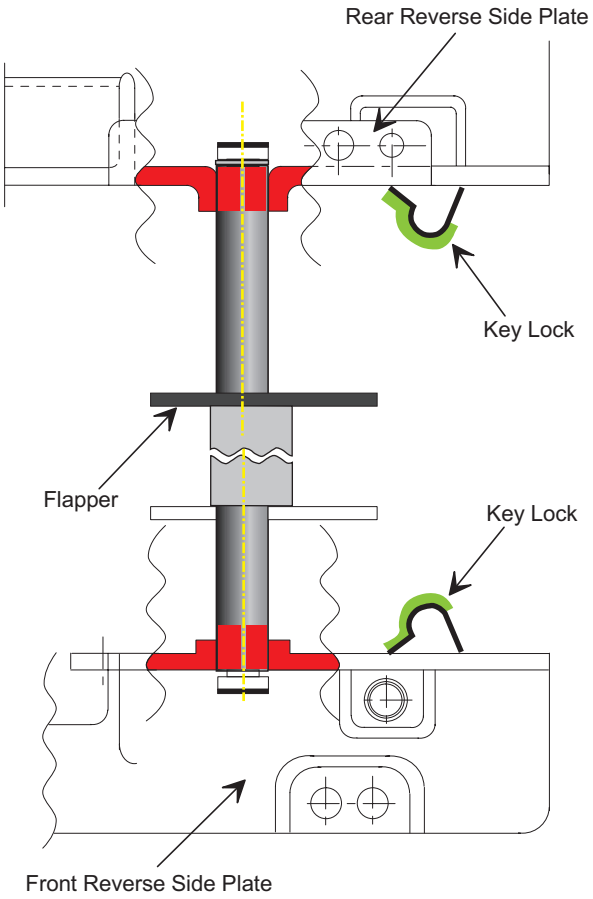


Figure 6-21. Lubricating Point (12)

Lubricating Point (13)

Points: Sliding parts of the registration roller bushings(8MM) (Colored areas in Figure 6-22)

Amount: 10 mg each

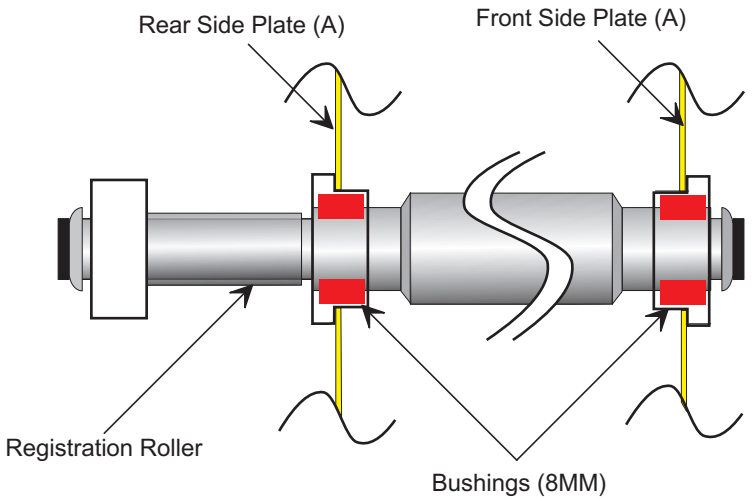


Figure 6-22. Lubricating Point (13)

Lubricating Point (14)

Points: Sliding parts for the bushings (MF) and the registration pinch roller (Colored areas in Figure 6-23)

Amount: 10 mg each

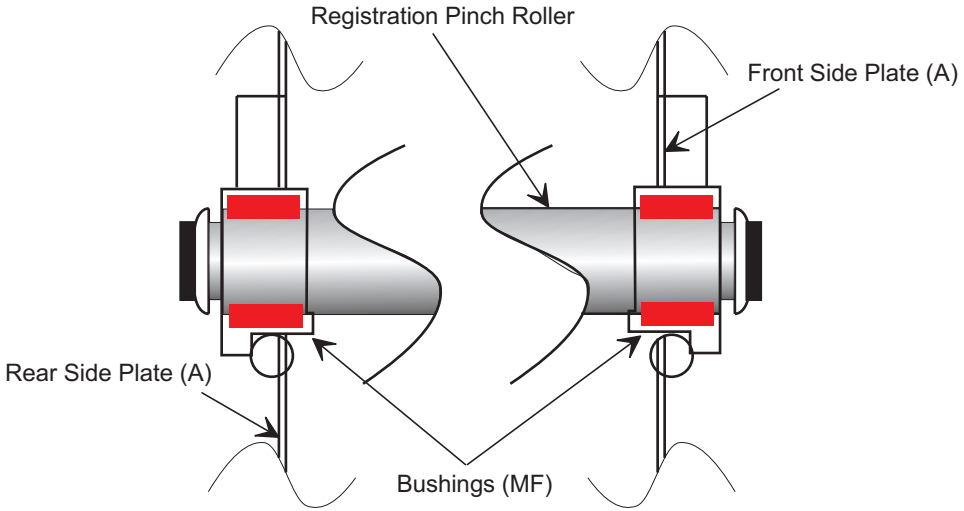


Figure 6-23. Lubricating Point (14)

Lubricating Point (15)

Points: Sliding parts for the registration links and registration pinch roller (Colored areas in Figure 6-24)

Amount: 10 mg each

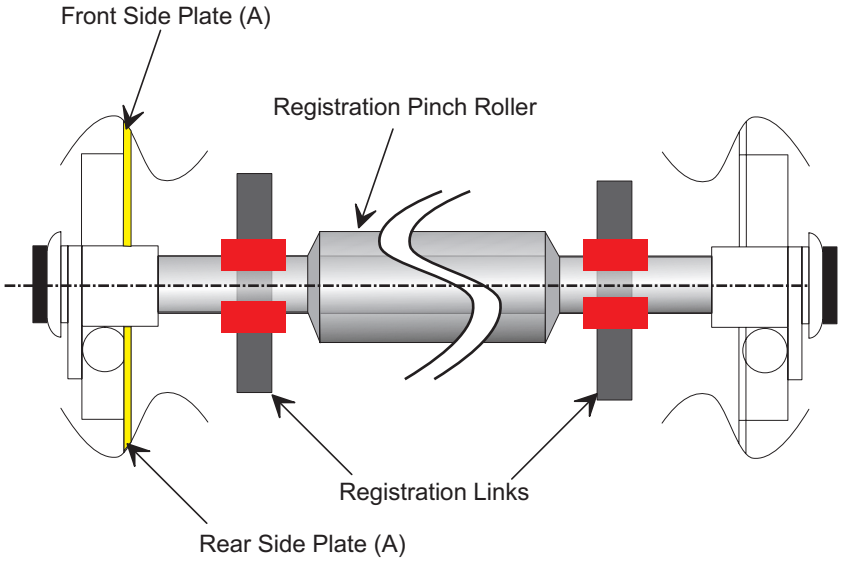


Figure 6-24. Lubricating Point (15)

6.1.3 Adhesion

This section provides adhering points in the ADF.

⚠WARNING ***Use only the adhesive specified for this ADF, since use of other adhesives may damage nearby parts. The specified adhesive is lock-tight #2 (B730200200).***

Adhering Point (1)

- ❑ **Occasion:** Front and rear pulley compression springs installation
- ❑ **Amount:** 5 mg each
- ❑ **Method:** Apply lock-tight to the points in the pulley roller holder where the front and rear compression springs are hooked.

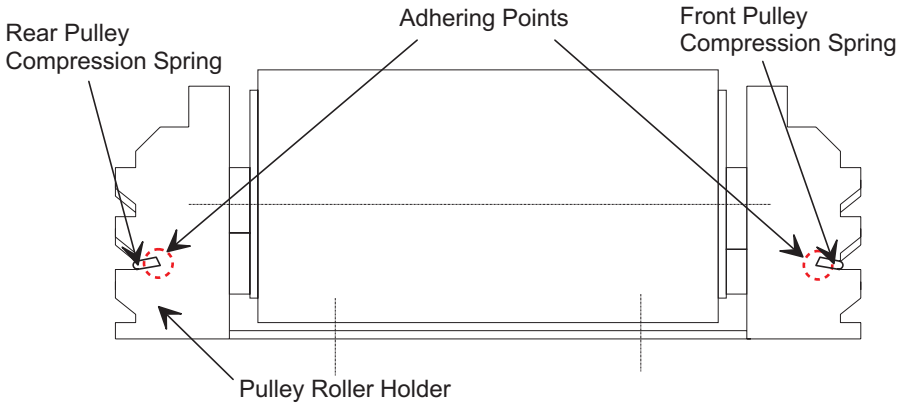


Figure 6-25. Adhering Point (1)

Adhering Point (2)

- ❑ **Occasion:** Belt Pulley (A) installation
- ❑ **Amount:** 5 mg each
- ❑ **Method:** Apply lock-tight to the upper half of the screw shaft (Colored area in the figure below), then fasten the screw.

  Note: *Do not apply any adhesives to the external surface of the pulley.*

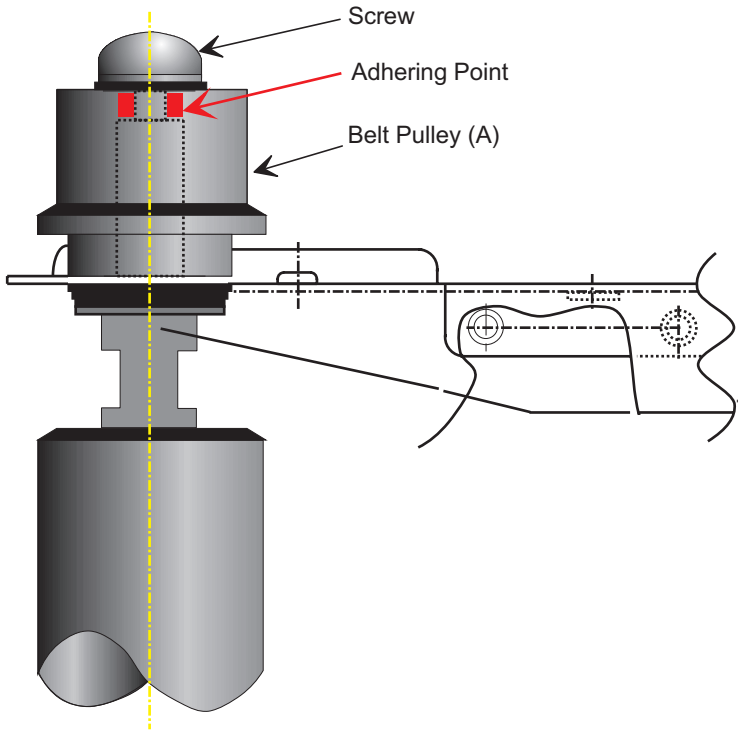


Figure 6-26. Adhering Point (2)

Adhering Point (3)

- ❑ **Occasion:** Discharging brush installation
- ❑ **Amount:** 5 mg each
- ❑ **Method:** Apply lock-tight to the half of the screw shaft from the head; then fasten the screw.

Note: *Do not apply any adhesives to the* brush.

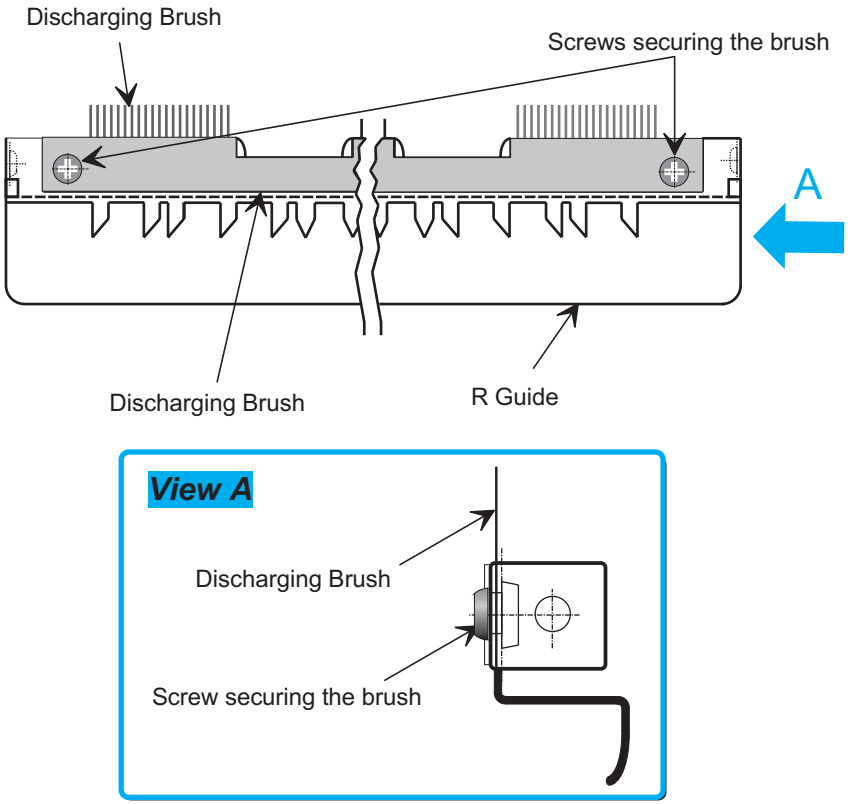


Figure 6-27. Adhering Point (3)

CHAPTER

7

APPENDIX

7.1 CONNECTOR SUMMARY

This section describes all connectors on the control board for the ADF and their corresponding signals and functions.

Table 7-1. Connector Pin Assignment (CN1)

Pin No.	Signal name	I/O destination	Signal level	Function
1	+5V	Document width detection volume	+5V	Inputs +5VDC for the volume resistance.
2	DWVR		0-5V	Outputs document width detection signal.
3	SGNG		----	GND
4	+5V	Empty sensor	+5V	Inputs +5VDC applied to the empty sensor.
5	SGND		----	GND
6	EMP		0 or 5V	Outputs paper empty sensor signal
7	+ 5V	Paper feed motor sensor	+5V	Inputs +5VDC for the photo-interrupter sensor.
8	SGND		----	GND
9	KM CLK		Pulse signal	Outputs motor rotation amount signal.
10	+5V	Timing sensor	+5V	Inputs +5VDC for the photo-interrupter sensor.
11	TIMS		– 3V or more: Present – 1V or less: Empty	Outputs paper empty/presence detection signal.
12	TIMS DA		– 3.8V: LED = On – 5V: LED = Off	Inputs LED drive signal. – Pre-feeding almost complete : On – Whole document through : Off
13	AN+24V	Registration sensor	+24V	Inputs +24VDC applied to the photo-interrupter sensor.
14	REGE		– 0.3 - 5V : Present – 1 - 15V : Empty	Outputs paper empty/presence detection signal.
15	RDDLED		0 - 24V	Inputs the LED light amount control signal.

Table 7-2. Connector Pin Assignment (CN2)

Pin No.	Signal name	I/O destination	Signal level	Function
1	*B	Transportation motor	Pulse signal	Outputs transportation motor drive signal change trigger.
2	B			
3	*A			
4	A			
5	+24V		+24V	Outputs +24VDC for motor drive.
6	+24V			

Table 7-3. Connector Pin Assignment (CN3)

Pin No.	Signal name	I/O destination	Signal level	Function
2	DFM 1 DFM 2	Paper feed motor	Pulse signal	Outputs paper feed motor drive signal change trigger.
3	DFSOL	Paper feed solenoid	Pulse signal	Outputs solenoid drive signal change trigger.
4	+24V	Paper feed solenoid	+24V	Outputs voltage for inducing solenoid.
5	FGOD	Paper feed cover open/ close sensor	– 0V: Open – 24V: Close	Inputs paper feed cover open/close status signal.
6	ADF +24V		+24V	Outputs +24VDC for inducing solenoid.
7	AUOD	ADF open/ close sensor		Inputs ADF open/close status signal.
8	DC +24V			Outputs +24VDC for the ADF open/close sensor.
9	----	----	----	----

Table 7-4. Connector Pin Assignment (CN4)

Pin No.	Signal name	I/O destination	Signal level	Function
1	FD+24V	Ejection cover open/close detection switch	+24V	Outputs +24VDC applied to the ejection cover open/close switch.
2	TGOD		▪ 0V: Open ▪ 24V: Close	Inputs ejection cover open/close status signal.
3 4	+24V +24V		+24V	Outputs +24VDC for reverse motor drive.
5 6 7 8	*B B *A A	Paper eject/Reverse motor	Pulse signal	Outputs reverse motor drive signal change trigger.

Table 7-5. Connector Pin Assignment (CN5)

Pin No.	Signal name	I/O destination	Signal level	Function
1	+5V	Paper eject/ Reverse sensor	+5V	Outputs +5VDC for Paper eject/Reverse sensor.
2	HANS		– 1V or less: Present – 3V or more: Empty	Inputs paper eject/reverse sensor detection signal.
3	HANS DA		– 3.8V: LED = On – 5.0V: LED = Off	Paper eject/reverse sensor photo-interrupter LED drive control signal.
4	+24V	Paper eject/ Revers solenoid	+24V	Outputs +24VDC for inducing solenoid.
5	DRSOL		Pulse signal	Outputs solenoid drive signal change trigger.

Table 7-6. Connector Pin Assignment (CN6)

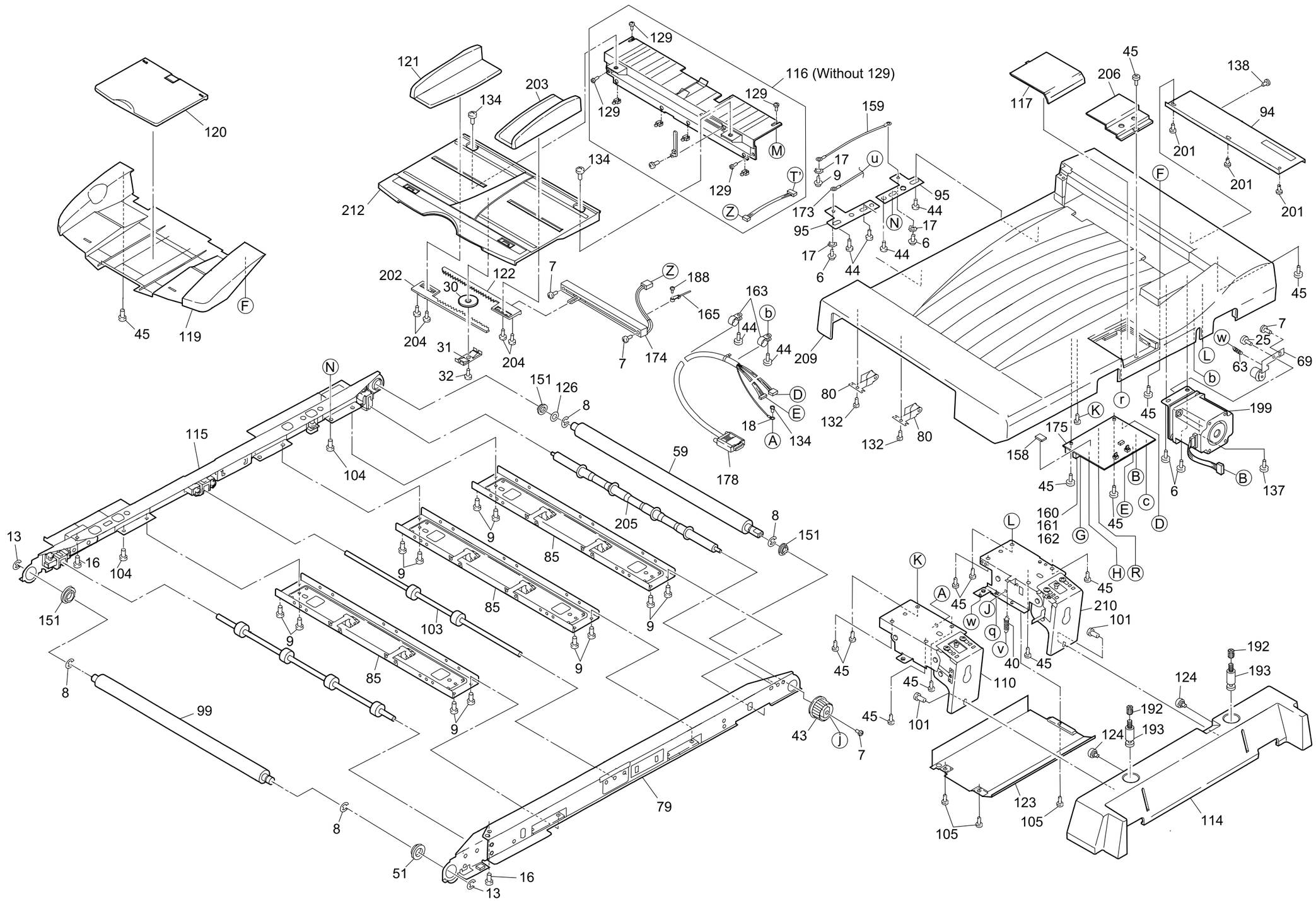
Pin No.	Signal name	I/O destination	Signal level	Function
1	TXD (RXD)	I/F cable	Pulse signal	Data receive signal
2	*TXD (*RXD)		Pulse signal	Inverse receive signal
3	RXD (TXD)		Pulse signal	Data transmission signal
4	*RXD (*TXD)		Pulse signal	Inverse transmission signal
5	DTR (DSR)		Request data	Data transmission request signal
6	DSR (DTR)		Accept request	Data transmission accept signal
7	GND		----	GND
8 9	OP1 OP2		GND	Option recognition signal (Out of SEC specification)

Notes: *Signals marked with ( ) are descriptions when viewed from the scanner side.*

Table 7-7. Connector Pin Assignment (CN7)

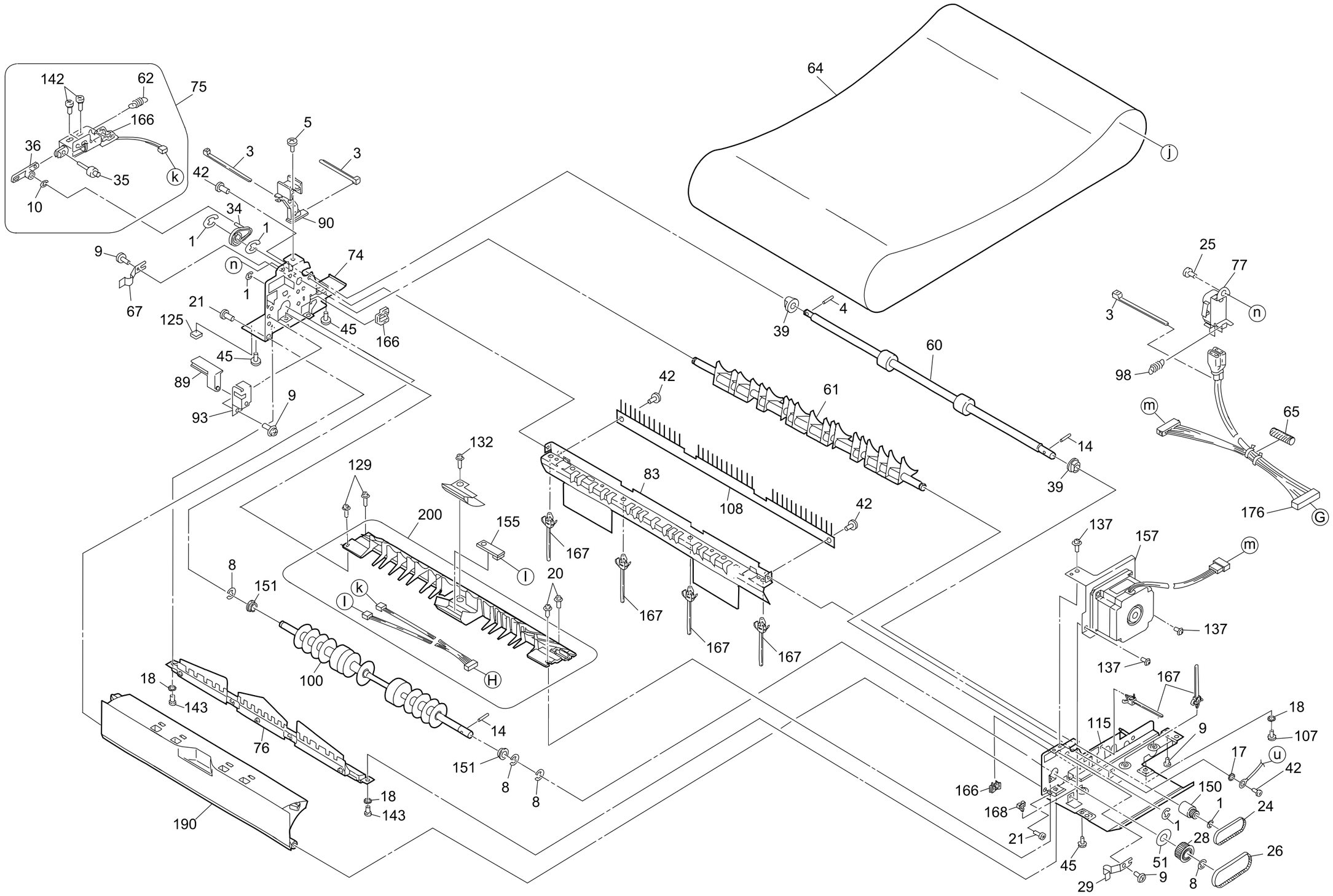
Pin No.	Signal name	I/O destination	Signal level	Function
1 2 3	+5V	I/F cable	+5V	Outputs +5VDC for system circuit.
4	GND		----	GND
5 6 7	+24V		+24V	Outputs +24VDC for drive circuit.
8	GND		----	GND

7.2 EXPLODED DIAGRAMS



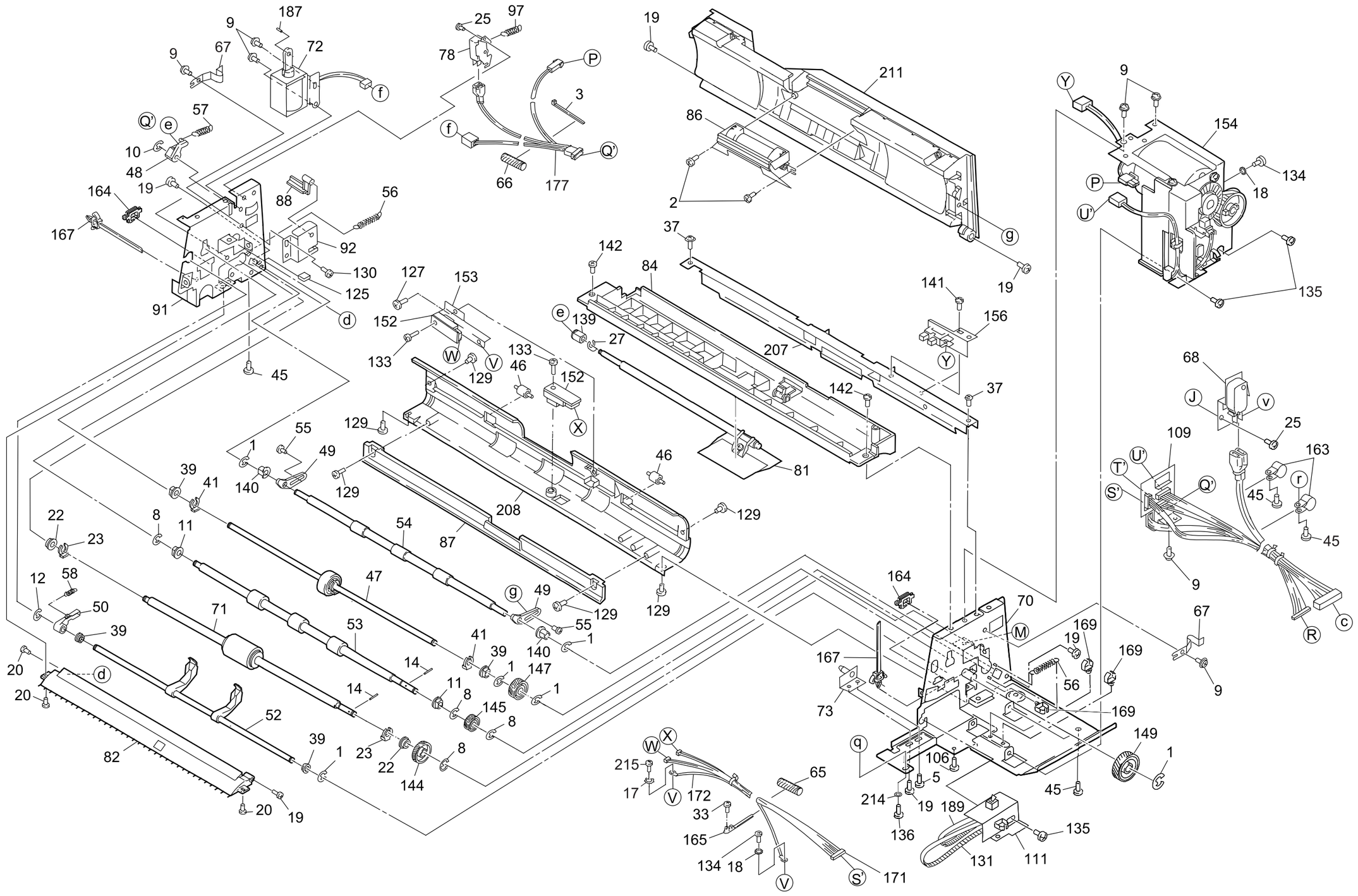
EXPLODED DIAGRAM FOR ESA3ADF EHC1(1/3)

Figure 7-1. Exploded Diagram (1)



EXPLODED DIAGRAM FOR ESA3ADF EHC1(2/3)

Figure 7-2. Exploded Diagram (2)



EXPLODED DIAGRAM FOR ESA3ADF EHC1(3/3)

Figure 7-3. Exploded Diagram (3)